# THE IRON TRADE REVIEW

VOLUME XXXIV. CLEVELAND, O. JANUARY 3, 1901. CHICAGO, ILL. NUMBER 1

## THE WEEK IN IRON CIRCLES.

### THE MARKET AT LARGE.

The iron trade enters upon the new year with generally good prospects, though, as has been the case for some months, the outlook for profits is better for mills and steel works than for blast furnaces. This difference is emphasized in the action taken on the last day of the old year by Mahoning and Shenango valley furnacemen reducing wages, while in the Pittsburg district the leading producers of finished material have notified their employes that no change in wages will be made. How soon the good conditions that appear in finished lines will work back to the producers of pig iron, is one of the things the new year must unfold. Blast furnace men drawing their ore supply from the Lake Superior region have had in 1900 the reverse of their experience in 1899. With raw material contracts and labor fixed on a high level, their selling price declined until in some instances it passed below the cost line. The coke price has been reduced materially in 1901 contracts; labor in the valleys is to be reduced 15 per cent February 1, or about one-half the advances brought by the boom. There is still the unsettled question of ore and that may not be reached for several weeks. There is a general feeling in the trade that prices will be fairly stable in 1901. The year begins with increasing consumption and increasing production, and prices generally firm; at the same time there are no signs of any considerable advance in the near future. The extent of the capacity that can produce at a fair profit on to-day's prices for finished material, having its own ore supply and in part at least its own coke, gives assurance of reasonable stability to the market. At present the large interests seem to be working under a good understanding. A question of some moment is the strain that the coming year will put upon existing relations. That some of the consolidations will encounter increased competition in 1901 is certain, and there are signs that some of the large companies will add to the list of their products. The result may be increasing inter-consolidation competition. One element in this will be the condition of foreign markets. In Great Britain prices are steadily declining; pig iron production has been curtailed considerably in the past two months, and the outlook for 1901 is far from assuring. In Germany, also, conditions are unsatisfactory. American steel works made a record in 1900 for exports, but in the last quarter new business for export has fallen off greatly, and if prices abroad continue to decline the home demand must expand appreciably to absorb the output of the mills. At the moment steel works are full of work, many of them being booked for months. Rail mills have promise of a busy year, sales being upward of 1,250,000 tons, including 75,000 tons in the past week, and 1901 is counted on to exceed the record of 4,800 miles of new track made in 1900. In plates the tendency is upward and it is probable a further advance will be made at a meeting in New York this week. A strike of structural workers is on in the Pittsburg district, but it is not likely that it will become a serious factor. The failure of an eastern pig iron firm has caused little comment in the trade and is in no sense significant.

### PITTSBURG.

OFFICE OF *The Iron Trade Review*,
429 PARK BUILDING, Jan. 2.

Representatives of 29 blast furnaces in the Shenango and Mahoning valleys met on Monday in the Bessemer Limestone Co.'s office at Youngstown, and decided to reduce the wages of the furnace workers in the valleys, the average being about 15 per cent. J. J. Spearman, of Sharpsville, presided. The new wages will go into effect on Feb. 1, and will affect 2,000 men. It was at first proposed that 10 per cent be taken off on January 1, and that a further reduction of 10 per cent be made within 60 days thereafter. The majority felt that a straight 15 per cent would be sufficient, and that no additional cut would then be necessary. The furnacemen have contended that the wages were out of all proportion to the price of pig iron. They say that the new scale will be the same as that in effect in March and April, 1899, before the market had made the sharp advance of the boom. Last year, three wage advances were given, and the pig iron makers say they cannot make money at present prices and wages, and that the new basis is still higher than that of the past few years. Before the boom top-fillers made $1.35 and $1.40 a day. The wages now are $1.80 a day. The reduction will make them about $1.50.

The iron and steel interests of this district view the coming year with a great deal of satisfaction, and the consensus of opinion is that it will be a prosperous one for all concerned. One year ago inflated prices prevailed. All felt positive that low prices would come sooner or later, but when none ventured to guess. That they did come is a matter of history. Today few artificial values exist. Producers of foundry iron are only making a fair profit, while makers of Bessemer are selling at cost. Steel billets at $19.75 do not represent an excessive profit, and in finished lines sheets alone seem to be enjoying what might be considered more than ordinary prices. Should the market go down, which is of course not expected, consumers know that it cannot drop very far, and manufacturers know that they cannot successfully operate at prices much lower than those ruling. On all sides there are indications that the market will hold its own for some months, and in a number of finished lines it is not improbable that prices will be advanced in the very near future. Plates rule the strongest, and that an advance will be made before the end of the month seems likely. In steel bars mills are unable to make deliveries, whil sheets are being contracted for far into the new year. In addition to the fact that the mills are pretty well taken care of for several months, buyers have a faith in the market that was entirely lacking one year ago.

While no official announcement has been made, the employes of the various interests of the Carnegie Steel Co. have been notified that they would receive the same wages during the coming year that were paid last year. As a matter of fact these wages are higher in instances than the scale of the Amalgamated Association, and it is doubtful if the old basis would have been continued had not the officials had implicit faith in the future of the market. The men employed by Jones & Laughlins Ltd., have also been notified that there would be no reduction. Meetings of the producers of steel billets and plates are scheduled to be held in New York this week. While nothing will be done in billets, it is probable that plates will again be advanced. The past week has been better than the trade generally anticipated, a good business having been placed when the fact is taken into consideration that it was holiday week.

PIG IRON.—The holiday week proved a good one for all kinds of pig iron, sales of fully 8,000 tons of Bessemer iron

being made at prices ranging from $13.50 to $14. The sales in the past month were much better than during the month of November, aggregating fully 20,000 tons. Considerable Bessemer iron contracted for a year ago at high prices still remains to be taken, although consumers are loathe to do so. In foundry iron there was considerable buying, prices ruling about the same as in the previous week. We also note the sale of 2,000 tons of Southern Foundry at $15.35, delivered Pittsburg. This is for delivery through the first half, and is to be utilized in a mixture. A sale of 5,000 tons of forge iron was made at $13.50 delivered Pittsburg, which is slightly above prices of the previous week. We revise quotations as follows:

| | |
|---|---|
| Bessemer, Pittsburg | $13.50 to $14.50 |
| No. 1 Foundry | 15.00 to 15.50 |
| No. 2 Foundry | 14.00 to 14.50 |
| No. 3 Foundry | 13.50 to 14.00 |
| Gray Forge, Pittsburg | 13.25 to 13.50 |

STEEL.—The buying of steel billets in small lots continues, but there are few inquiries for this product for future delivery. No concessions from the pool basis are obtainable. We quote: 4x4 billets, delivered, Pittsburg, Wheeling or Valley at $19.75. On less than 4-inch billets down to 1½-inch $1 extra is charged. Open-hearth billets are $1 per ton above Bessemer billets at all delivered points. Sheet and tin bars are $1 above Bessemer billets.

FERRO-MANGANESE.—The closing week of the year found the market quiet, with unchanged prices. Domestic 80 per cent is quoted at $62.50 per ton, delivered at buyer's mill in carload lots.

RAILS AND TRACK MATERIAL.—In the past week the Carnegie Steel Co. received an order for 6,000 tons of rails for the Great Eastern Railway of England. Considerable other export business is pending. Very few of the large roads of the country have failed to place their orders and the new year finds the Edgar Thomson plant of the Carnegie Steel Co. filled up for the greater portion of the year. Light rails are still in excellent demand, as the development of coal mines in this district is going on at a pace never yet equaled. Prices are unchanged as follows: Rails, standard sections, 50 pounds and over, in lots of 200 tons and over, $26; car lots and less than 200 tons, $28; less than car lots, $30; 8 to 12 pounds, $29 to $30; 16 to 20 pounds, $28 to $29; 25 to 40 pounds, $27. Track material: Spikes, 1.70c to 1.75c; track bolts, square heads, 2.25c; hexagon heads, 2.35c; fish plates, 1.40c to 1.50c.

MUCK BARS.—There have been no sales on which to base a price, although manufacturers are offering their product at prices ranging from $25 to $25.50, delivered, Pittsburg.

SKELP.—The demand for iron and steel skelp during holiday week has been very limited and only sales in small lots were made. Iron skelp is held at 1.55c to 1.60c, while steel skelp is held at 1.35c, delivered, Pittsburg.

BARS.—While the new business in steel bars during the past week has not been large, the specifications on contracts closed last fall were exceedingly heavy, and manufacturers are getting further behind on their deliveries. Prices remain firm at 1.25c, Pittsburg, although small lots demand 1.30c to 1.35c. Refined iron bars are held 1.75c to 2c, delivered, Pittsburg.

PLATES.—The extreme activity in plates that has continued for more than a month past continued during the past week and nearly every mill in this district has orders that will keep it in full operation for three months at least. Producers are not at all anxious to close business at ruling quotations, and some refuse to take business for delivery within the next six months. A meeting of the plate manufacturers is to be held in New York shortly, and there is every indication that the price will be advanced. One of the large orders placed during the week was for 5,000 tons for delivery in four months. Prices are firm as follows: Tank plate, ¼-inch thick, up to 100 inches in width, 1.40c at mill, Pittsburg; flange and boiler steel, 1.50c; marine, ordinary firebox, A. B. M. A. specifications, 1.60c; still bottom steel, 1.70c; locomotive firebox, not less than 1.90c, and it ranges in price to 3c. Plates more than 100 inches wide, 5 cents extra 100 pounds. Plates 3-16 of an inch in thickness, $1 extra; gauges Nos. 8 and 9, $2 extra. These quotations are based on carload lots, with 5 cents extra a hundred pounds for less than carload lots. Terms, net cash in 30 days.

SHEETS.—The sheet market is in excellent condition at the opening of the new year. Prices a year ago ruled no higher than today, despite the fact that sheet bars were selling at $36. It is to be said, however, that there were few sheet mills enjoying the great prosperity of the iron and steel business that existed one year ago. Competition was intense. Prices at that time were exceedingly low when compared with those of other finished products. While some business for the first half of the year has already been closed, the bulk is yet waiting. Judging from the large number of inquiries received by the manufacturers, there is little doubt that considerable will be placed within the next two weeks. We make the following quotations: Black sheets, No. 28 gauge, one pass through cold rolls, 2.95c to 3c; No. 27, 2.85c to 2.90c; No. 26, 2.70c; No. 24, 2.60c; No. 22, 2.50c; No. 20, 2.40c; No. 18, blue annealed, 2.15c to 2.20c; No. 14, 1.90c to 2c; Nos. 11 and 12, 1.75c to 1.85c; No. 10, 1.65c to 1.70c; plates, gauges 8 and 9, 1.55c to 1.60c. Galvanized sheets continue to be held at 75 off with no freight allowance.

STRUCTURAL MATERIAL.—Little new business was placed for structural material during the past week owing to the holiday season. The coming season will certainly be a prosperous one for the Pittsburg mills, as several large buildings are being projected, any one of which will require more than 5,000 tons of structural shapes. Prices are as follows: Beams and channels, 3 to 15 inches, 1.50c; 18 to 24 inches, 1.60c; tees, 1.55c; zees, 1.50c; angles, from 3 to 6 inches, 1.40c; universal mill plates, 1.35c.

PIPES AND TUBES.—The largest producer announced a reduction in the price of steel boiler tubes which became effective with the first of the year. Other products, however, remain unchanged. Business in the week has been confined to small lots, although the amount placed during December exceeds in tonnage that of the same month last year. As noted in these columns last week the National Tube Co. is negotiating for the purchase of the plant of the Standard Seamless Tube Co., at Ellwood City, Pa., to increase its seamless tube output. At this writing the matter is not closed. We revise discounts to consumers in car lots, Pittsburg, as follows:

MERCHANT PIPE.

| | Black. Per cent. | Gal'vd. Per cent. |
|---|---|---|
| ⅛ to ⅜ inch and 11 to 12 inch | 61 | 48 |
| ¼ to 10 inch | 68½ | 56 |

BOILER TUBES.

| | 22 Feet and under. Per cent | | Over 22 Feet. Per cent. | |
|---|---|---|---|---|
| | Iron. | Steel. | Iron. | Steel. |
| 1 to 1¾ and 2¾ to 5 inches, inclusive | 49½ | 68⅛ | 44½ | 65 |
| 2 to 2¼ inches, inclusive | 45 | 61 | 39½ | 59 |
| 6 inches and larger | 57 | 62 | 52⅛ | 58 |

CASING.

| | S. and S., per cent. |
|---|---|
| 2 to 3 inches | 58 |
| 3¼ to 4 inches | 63 |
| 4¼ to 12⅛ inches | 65 |

O. D. PIPE.

| | Per cent. |
|---|---|
| 14 to 22 inches | 42 |
| 24 inches, o. d. and larger | 37 |

THREADS AND COUPLINGS.

| | Per cent. |
|---|---|
| 14 to 16 inches, o. d. | 35 |

MERCHANT STEEL.—Specifications on contracts for tire steel placed during the fall have been received in large numbers in the past week and mills are operating full capacity to make deliveries. Prices on tire steel and toe calk rule somewhat better. We revise our quotations as folows: Tire steel in carload lots and over, 1.40c; less than carload lots, 1.45c to 1.50c. Toe calk is held at 1.50c to 1.55c in large lots, and in small lots as high as 1.60c. Tool steel is held at 7c and upwards according to quality. Hoops and bands, 2c to 2.10c; shafting, carload lots, 57 per cent off; less than carload lots, 52 per cent off.

WIRE AND WIRE NAILS.—The first of the year has brought with it no change in prices, as many jobbers and consumers desired and anticipated. Prices are unchanged as follows: Singe carloads of wire nails to jobbers, $2.20, Pittsburg; to retailers, $2.30. Plain wire, carload lots, is quoted at $2.15 to jobbers, and $2.25 to retailers; painted barb wire, $2.50 in carload lots to jobbers and $2.60 to retailers; galvanized barb wire, $2.80 in carload lots to jobbers and $2.90 to retailers. Cut nails are held at $1.95, Pittsburg, in carload lots with 2 per cent off in 10 days.

OLD MATERIAL.—Consumers of old material are holding off and are buying for immediate consumption only. They be-

lieve that prices have been ruling somewhat higher than those of other iron and steel products and hope to see some concessions made. We revise quotations as follow, gross tons, delivered Pittsburg: No 1 railroad wrought, $18; car wheels, $18; new Bessemer melting stock, $14; iron rails, $20 to $21; steel rails, mill lengths, $14.50; busheling scrap, $9; borings, $6.75; turnings, $9.

COKE.—The largest producer reports that contracts placed during the past week practically dispose of its product for the next six months. The low quotations have induced consumers to buy for six months, and the eastern furnacemen, who have been holding off in anticipation of better prices were first to close for the first half. While the leading interest is securing $1.75 for Connellsville furnace coke, other producers in that region are quoting as low as $1.60 and $1.65. Furnace coke produced outside of the Connellsville region has been sold in the week at $1.40 to $1.50. Foundry coke is held at $2 to $2.25. For the week ending Saturday, December 22, the total estimated production of the Connellsville region was 179,125 tons, an increase over the previous week of 16,939 tons, the greatest gain recorded for many months. Shipments for the week aggregated 9,137 cars, distributed as follows: To Pittsburg and river tipples, 3,428 cars; to points west of Pittsburg, 3,930 cars; to points east of Connellsville, 1,779 cars.

## CHICAGO.

OFFICE OF *The Iron Trade Review*,
1522 MONADNOCK BLOCK, JAN. 2

All branches of the market have been experiencing the usual holiday quietness, and sales have been made almost entirely in small lots. The general tone, however, is one of strength, as the mills and furnaces are well equipped with orders to start in the new year, and the outlook for business early in 1901 is most excellent. Makers of iron and steel generally look forward to the coming year with the expectation that it will at least be as good as any preceding, and with the hope that it may greatly exceed any previous year both in tonnages and prosperity.

PIG IRON.—While most of the business placed in the week has been for small lots, an occasional order for from 300 to 500 tons was given, and the total for the week was fully up to that of any previous holiday week. Some of the furnaces farther east have been placing iron in this market at figures somewhat under those made by the local and southern makers, but this business has been limited to comparatively small lots, and has not influenced the market. The tone is distinctly one of strength, and furnaces are getting all they ask for their products. Stocks both in makers' and consumers' hands are small, and the furnaces are well sold ahead, some of them for six months on various grades, and buyers would find it exceedingly difficult to place any large business at anything under the figures we quote. The furnaces are usually satisfied with the present prices, which give them a good profit with ample assurance that buyers will be able to use the maximum quantities, and no effort is being made to advance quotations at present. Prices are unchanged as follows.

| | | | |
|---|---|---|---|
| Lake Sup. Charcoal | $18 50 to $19 50 | Southern Coke No. 4 | $13 60 to $14 10 |
| Local Coke Fdy. No. 1 | 15 75 to 16 00 | Southern No 1 Soft | 15 10 to 15 60 |
| Local Coke Fdy. No. 2 | 14 75 to 15 00 | Southern No. 2 Soft | 14 60 to 15 10 |
| Local Coke Fdy. No 3 | 14 25 to 14 50 | Southern Silveries | 16 25 to 16 75 |
| Local Scotch Fdy. No.1 | 15 75 to 16 00 | Jackson Co. Silveries | 18 50 to 20 00 |
| Local Scotch Fdy. No.2 | 14 75 to 15 00 | Ohio Strong Softeners | 16 80 to 17 30 |
| Local Scotch Fdy No.3 | 14 25 to 14 50 | Alabama Car Wheel | 21 75 to 22 75 |
| Southern Coke No. 1 | 15 10 to 15 60 | Malleable Bessemer | 15 00 to 15 50 |
| Southern Coke No. 2 | 14 60 to 15 10 | Coke Bessemer | 15 00 to 15 50 |
| Southern Coke No. 3 | 14 10 to 14 60 | | |

BARS.—The demand has been exceptionally good, considering the season, and several good inquiries for future shipment are under consideration at present, with every prospect of their being closed within a short time. Sales of the week were limited to small quantities, but the mills are well filled with orders for the next few weeks, and are very firm in their views as a consequence. Prices are unchanged at 1.45c to 1.50c for both iron and steel bars.

STRUCTURAL MATERIAL.—No large sales were made in the week, and while it is hardly expected any will be made immediately after the opening of the year ,the outlook for the future is much brighter than it has been for a long time past, as the local labor troubles seem to be in a fair way to be finally settled. Much business is expected to be placed as soon as owners can be assured of a prospect of completing their buildings in peace, and it is fully expected that a very considerable tonnage of building shapes will be used in the coming year, possibly more than in any previous year. Several large projects are scheduled to go ahead as soon as the conditions will warrant. Quotations are unchanged as follows: Beams 15 inches and under, 1.65c; 18 inches and over, 1.75c; angles under three inches, 1.40c to 1.45c; over six inches, 1.65c; three inches to six inches, 1.55c; plates, 1.55c; tees, 1.70c; zees, 1.65c; small lots from store are quoted ¼c to ½c higher.

RAILS AND TRACK SUPPLIES.—Sales of the past two weeks will aggregate fully 50,000 tons, by the local mills, in this territory. This is for standard sections. Besides this, orders for light sections have been excellent, adding considerably to the total tonnage. The demand for track supplies of all kinds is good, and sales have been large. Quotations are as follows: Rails, standard sections, $26; light sections, $26 to $28; splice bars, 1.40c to 1.50c; spikes, 1.70c to 1.75c; track bolts, hexagon nuts, 2.55c to 2.60c; square nuts, 2.40c to 2.50c.

PLATES.—No important orders have been placed, and it is not thought any will be given out immediately, but makers expect a good trade in the ensuing month. The mills are well filled with business for the first three months of the year, and on some sizes for six months. As a consequence the market is very firm. Prices are made as follows, mill shipment, Chicago delivery: Tank steel, 1.55c; flange steel, 1.65c; marine steel, 1.75c; fire-box steel, ordinary, 1.75c; fire-box, special, 2.25c and upwards.

BILLETS AND RODS.—There is nothing new in this branch of the market. A few small sales of billets have been made, at the schedule price of $20.75, Chicago. Rods were not sold in the week.

SHEETS.—Orders have been unexpectedly large and frequent considering the season, and both jobbers and consumers appear to be buying very freely. Mills are getting a little behind in their shipments, and are full of orders for several months to come. Quotations are very firm and unchanged at 3.18c for No. 27 black, and 70 and 10 per cent. off for galvanized, mill shipment.

MERCHANT STEEL.—The week has been quiet, with only a few unimportant sales closed. The mills are so well filled with business for the future as to welcome any let-up in the demand, however. The market is very firm. Quotations are as follows, mill shipments, Chicago delivery: Smooth-finished tire steel, 1.75c to 1.85c; open-hearth spring steel, 2.15c to 2.35c; toe calk, 2.40c to 2.55c; sleigh shoe, 1.70c to 1. 80c; cutter shoe, 2.40c to 2.55c; ordinary tool steel, 6c to 7c; specials, 13c and upwards.

MERCHANT PIPE.—Orders have been very good, considering the season, and the outlook for the opening of the year is most excellent. Several good contracts are expected to be placed within a short time. Random lengths are quoted as follows, Chicago delivery:

MERCHANT PIPE.

| | Carload lots. Black Per cent. | Carload lots. Galv. Per cent. | Less than carload lots Black Per cent. | Less than carload lots Galv. Per cent. |
|---|---|---|---|---|
| ⅛ to ½ and 11 to 12 in | 59.2 | 46.2 | 54.9 | 40.9 |
| ¾ to 10 inches | 66.7 | 53.3 | 61.9 | 49.9 |

WIRE AND WIRE NAILS.—Sales have not been especially active, compared with recent weeks, but have been exceptionally good considering the season of the year. The mills close the year with a large tonnage of orders on their books, and a most excellent prospect ahead for the future. Makers quote single carloads of wire nails at $2.48 f. o. b. Chicago, and $2.63 for less than carloads. On wire, current quotations are as follows: Plain annealed wire, $2.43; painted barb wire, $2.78; galvanized barb wire, $3.08.

OLD MATERIAL.—Nothing of importance has been done in the week. Sales have been only small, and the demand does not indicate any great business for the immediate future. Dealers are firm in their views, however, and are not making any concessions from quotations. Dealers' selling prices, per gross ton, are given as follows:

| | | | |
|---|---|---|---|
| Old iron rails | $18 50 to $19 00 | Country malleable | $11 00 to $12 00 |
| Old steel rails, long | 15 00 to 16 00 | Iron axles | 20 50 to 21 00 |
| Old steel rails, mixed | 11 00 to 12 00 | Cast borings | 4 50 to 5 00 |
| Relaying rails | 20 00 to 22 00 | Wrought turnings | 8 00 to 9 00 |
| Old wheels | 15 00 to 16 00 | Iron axle turnings | 9 50 to 10 00 |
| Railroad forge | 16 50 to 17 00 | Steel axle turnings | 8 50 to 9 00 |
| Dealer's forge | 14 50 to 15 00 | Mixed country steel | 9 50 to 10 00 |
| No. 1 cut mill | 11 00 to 12 00 | Stove plates | 8 50 to 9 00 |
| Heavy cast | 13 00 to 14 00 | Heavy melting steel | 10 50 to 11 00 |
| Railway malleable | 13 00 to 14 00 | Old iron splice bars | 18 50 to 19 50 |

# The Chicago Iron Trade in 1900.

The year just closed has been in many respects a quiet one, and free from the excitement that characterized the preceding year, yet taken as a whole it has brought satisfactory returns to the manufacturers of iron and steel. The total tonnage handled was not as large as in 1899, but was beyond that of any other year. Higher costs for raw material than in 1899 and falling prices for finished products have put a strain upon some manufacturers, but for most there has been a fair profit. The highest point of the market was at the opening of the year on nearly every commodity, and there was an almost constant decline in values from early in the year to November, when quotations on materials for which there was an open market experienced a decided stiffening. Prices of some of the commodities controlled by combinations or pools were advanced somewhat earlier, with the exception of rails, which were reduced $9 a ton in September.

At the opening of the year mills and furnaces generally had their output engaged for three to six months ahead. The demand for material of all kinds had fallen off to some extent, and was not large for the first two or three weeks, but showed a considerable increase by the first of February. In that month trade was heavy, but early in March it was seriously affected by the strikes in the machinery and building trades, and sales were made for most classes of material in diminishing volume from them until early in the fall.

In April, after it was definitely expected by the trade generally that lower prices on all products would come radical action was taken by the directors of the American Steel & Wire Co. in reducing prices on the company's products $18 and $20 a ton, and at the same time shutting down nearly all its mills. At first it was thought this action, although conceded to be necessary by many of the most clear-headed men in the trade, would have a very bad effect because of its summariness and unexpectedness. The building trades strikes had had their effect on the operations of the company, and for this and other reasons its business had fallen off to such an extent that it was impossible to secure orders at anything like the old high prices, in sufficient quantities to keep the mills running. Later developments showed that the action taken by the company was of more benefit than any other could have been. It put the market at once on a basis where buyers could make maximum purchases, and it was a comparatively short time before the mills of the company were again running full time.

Just previous to election day in November and for two or three weeks following a very brisk business was done. The success of the administration at the polls was the thing needed to enliven trade and to insure confidence, not only in the immediate future but in the prospects for the ensuing year at least. In November and in December until just before the holidays, business was excellent, and the year closed with order books filled for the ensuing six months.

### Consolidation and Other Changes.

Several important consolidations were effected in 1900. First in order of time and among the most important was the American Sheet Steel Co., formed in February, with a capital stock of $52,000,000, half being preferred and half common stock. This company took in nearly all of the sheet mills of the country, and its products embrace black and galvanized sheets, and planished and polished iron. The company is closely affiliated with the National Steel Co., the American Tin Plate Co. and the American Steel Hoop Co. The Shelby Steel Tube Co. was also formed in February, with a capital stock of $15,000,000 of which $7,000,000 is 7 per cent cumulative preferred and $9,000,000 is common stock. The company took in seven rolling mills, making blanks for seamless tubes, and drawing seamless tubing, besides ten seamless tube works. In June the formation of the Crucible Steel Co. of America was effected, the company having a capital stock of $50,000,000 divided into $25,000,000, 7 per cent cumulative preferred, and $25,000,000 common stock. The company operates 13 rolling mills and steel works, with a product of open hearth and crucible steel ingots, forgings, castings and finished rolled steel.

Locally no important changes occurred, but the furnaces and mills in this territory have increased their capacity to a considerable extent through improvements and additions. One new furnace, owned by the Iroquois Iron Co. is in process of construction at South Chicago, and two are being built at the south works of the Illinois Steel Co. All of these will be put in operation in 1901. Consumptive capacity has also increased several large new plants having been completed in the year, while others are in process of erection or are contemplated.

### Pig Iron.

Furnaces were well sold ahead at the opening of the year, some of them from three to six months. In January the demand was not especially large, but was sufficient to hold the market steady into February, when, with a somewhat smaller inquiry and hardly so good an outlook for the future there was some weakening in values. From then until almost the end of the year the market declined steadily, gaining a little strength in December, owing to the fact that the furnaces were so well sold ahead as to be able to advance their quotations without much objection on the part of the consumers. The decrease from January to early November, when the lowest point was reached, was from $24.50 for local No. 2 foundry iron to $14, a loss of over 40 per cent. Prices on southern irons showed a less percentage of loss, the quotations at the beginning of the year being somewhat under those of northern iron; the bottom prices of the year and the closing prices, $14 and $14.50, respectively, were the same for southern and local irons. All the furnaces in Chicago territory making foundry iron ran full until August. In that month all the foundry iron furnaces in this territory, with the exception of the Iroquois, went out of blast, in accordance with the plan adopted by the pig iron manufacturers at a meeting held in July, at which it was decided to restrict the manufacture of pig iron as much as possible. The furnaces remained out of blast until November, when all of them, with the exception of Calumet, were put in blast again, having sufficient business in hand to warrant resumption. The Iroquois furnace ran throughout the year, and the Calumet is still out of blast, but will be put in again within a short time.

Notwithstanding the great reduction in the price of pig iron, but one change has been made in freight rates on pig metal from southern furnaces in the year. On October 1 a reduction of 50 cents a ton was made in these freight rates, from $4.35 to $3.85, Birmingham to Chicago.

Sales of law grades of iron in this territory were largely increased in the year through the purchases of the Republic Iron & Steel Co. and the U. S. Cast Iron Pipe & Foundry Co., which before the formation of these companies were made at the various headquarters of the concerns taken into them. As a consequence this has been a more important market for these irons than in former years although of course the actual consumption in this territory has been no greater than heretofore.

Sales of pig iron of all kinds were fairly large in January and February, many of the orders closed in those months running into thousands of tons. In March and April business fell off to a considerable extent caused partly by the strikes in the machinery and building trades, and partly because consumers had arrived at the conclusion that prices were too high, and were placing orders only for immediate requirements until such time as the quotations should be lowered materially. Early in May a considerable tonnage of charcoal iron was purchased by car wheel manufacturers. From then until late in the summer the demand was almost entirely limited to small lots with now and then a fairly large sale; and foundries, besides not running full, were buying only for pressing needs, expecting lower prices soon. Quotations were reduced gradually in response to pressure from the buyers until late in August iron was selling on a basis of $15 for No. 2 foundry. With these lower prices and the nearing of the end of the usual summer dullness, business picked up a good deal and orders were much more frequent and for larger amounts. No very decided buying movement was had how-

ever, until the week before election. Buyers at that time appeared anxious to discount the favorable results to be expected from the return of the administration, and made very large purchases, orders being more numerous and for much larger tonnages in the two weeks preceding and following election than in any similar period in the year. As a result of this prices which had dropped to as low as $14 and in some cases to a lower figure for No. 2 foundry iron, were strengthened and from then until the end of the year iron was sold at an advance of from 50 cents to $1 a ton over the lowest figures made.

The productive capacity of furnaces making foundry iron in this territory will be increased quite a little in the coming year by the addition of one furnace each to the plants at South Chicago of the South Chicago Furnace Co. and the Iroquois Iron Co. The former is in contemplation and will probably be built in 1901, and the latter is nearing completion. The furnace plant of the South Works of the Illinois Steel Co. is also being increased by the addition of two furnaces, which will be ready for blast early in the spring.

### Finished Material.

Taken as a whole the sale of finished material in Chicago in 1900 was probably from 15 to 20 per cent less in tonnage than in the year previous, but was probably larger than in any other year. The course of the market on such commodities as were not included in pooling arrangements or controlled by combinations was steadily downward from January to late October, though in bars and sheets the low point was touched in August. Considerable strength was displayed in the late fall in all finished lines with higher prices, and the year closed with a stationary market and advancing tendencies. Rails remained at $35, the opening, until September, when they were placed at $26, remaining at that figure until the end of the year. Billets sold from $35.50 in January down to $19 in August, advancing again in November to $20.75. At the beginning of the year it was confidently expected that 1900 would show fully as large a business as 1899, and while it was conceded that prices were too high for a continued large consumption of material, it was by no means thought they would be reduced to the levels they finally reached. In the first three months of the year a brisk trade was had in most classes of finished material and orders were plentiful and of good size.

The second quarter of the year was hardly so good from the seller's standpoint the mills being out for business, while buyers were becoming more and more indifferent every week. In the summer months the usual dullness of the season was possibly a little accentuated, and the mills were hardly able to secure enough business to keep running. The formation of the Crucible Steel Co. of America in August unsettled the tool steel market to a great extent, as buyers did not know how it would affect the situation and held off, awaiting results. In September and October quite a little improvement in the market was noticeable, sales increasing, with better prices, and in November buying was heavy and prices steady. December buying was good, with no material change in prices, and with both buyers and sellers satisfied with the market. With the exception of a few scattered large orders, business in rails was compressed into the last three months of the year, after the price had been fixed on deliveries for 1901. The buying has hardly been as large this year as last up to the end of the year, but the rail mills have enough orders on hand and in sight to make them fairly sure of continuous work for the ensuing year.

In bar iron and steel the market was fairly steady in the first half of the year. In June, after several weeks of light business, the bar iron mills shut down, pending a settlement of the wage scale. Some of the independent mills started up again almost immediately, working on a tentative scale, and these and the steel bar mills were able to secure most of the business during the summer months. This amounted to a very heavy tonnage, as the difficulty the bar iron mills were having in closing arrangements with their men, and the very low prices made by the steel mills, induced many of the large buyers to give the latter their orders. Most of this business was closed in July and August. It was not until late in September that the bar iron scale was adjusted, and it was then thought, at first, that the iron mills might have some difficulty in securing sufficient business to warrant continuous operations. Most of the combination mills, however, have been running continuously since then, and at present sufficient orders are on the books to promise good operations well into the coming year.

In structural material the year has been only fair. Building operations in Chicago city have been greatly hampered by the strikes in the building trades, and only a very few large contracts have been placed in the year. Outside the city operations have been up to the average. In bridge, railroad and car work the use of steel has been very large and is steadily increasing. Many bridges have been erected in the west and many more are projected.

Little business has been placed, openly, in billets and rods. One consumer takes the output of the Joliet rod mill, and billets in this market are sold to so few, that it is a very difficult market to follow. The product of the local and Joliet plants is almost entirely taken by the same mills for material of higher finish, and by the western wire mills.

Business in plates has been heavy throughout most of the year. The market was an open one until November, when an agreement was reached by all the mills rolling plates, and prices were advanced $2 a ton to 1.50c, Chicago, the bottom of the market for the year 1.25c, having been reached in August and October.

In merchant steel, sheets and wire products the market followed the general trend of other materials throughout the year. Sales of wire products were exceptionally large in the year, especially in the last half, after the largest maker had made its radical reduction in prices and they had had time to settle down. Sales of the last six months of the year were larger than in any previous six months in the history of the trade.

### Old Material.

There have been few transactions of moment in the old material trade, the market being to a large extent controlled, at least in many grades by the needs of one consumer, the Republic Iron & Steel Co. Other like buyers are apt to follow in the footsteps of this largest consumer to a great extent. Sales for the year, while hardly as large as in 1899, were up to those of any other year, and were satisfactory to dealers, as a rule. The market experienced some fluctuations, but generally speaking it steadily declined from January, until September, when it gained in strength and higher prices were obtained on nearly all grades of scrap.

### Average Monthly Prices.

The range of prices in the year is shown in the following table of average prices for each month on the leading forms of iron and steel. It does not show necessarily the highest or lowest prices touched, but the average month by month, as computed from weekly reports.

AVERAGE MONTHLY PRICES OF IRON AND STEEL AT CHICAGO IN 1900.

[Pig iron and billets, gross tons; finished material, net tons]

| | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L. S. Char. Ir'n | 25.50 | 25.50 | 25.50 | 25.25 | 24.50 | 23.25 | 22.00 | 20.00 | 18 10 | 17.60 | 16.50 | 18.50 |
| Nor. No. 2 Fdy | 24.50 | 24.25 | 23.75 | 23.25 | 22.00 | 20.25 | 17.75 | 15.50 | 14.50 | 14.00 | 14.25 | 14.'0 |
| Sou. No. 2 Fdy | 21.85 | 21.85 | 21.85 | 21.70 | 21.35 | 20.00 | 18.00 | 15 40 | 14.85 | 14.00 | 14 25 | 14.60 |
| Bar Iron | 46.50 | 46.00 | 46.00 | 43.50 | 41.00 | 36.00 | 28.25 | 25.25 | 26 00 | 26.00 | 27.25 | 27.50 |
| Rails | 35 00 | 35 00 | 35.00 | 35.00 | 35.00 | 35.00 | 35.00 | 35.00 | 32 75 | 26.00 | 26,00 | 26.00 |
| Plates | 52 50 | 50.00 | 45.25 | 42.00 | 38.75 | 32.75 | 28.00 | 25.00 | 26.00 | 25 00 | 29.25 | 30.75 |
| Billets | 35.50 | 35.00 | 35.00 | 35.00 | 30.00 | 29.00 | 24.00 | 19.00 | 19 00 | 19.00 | 20.25 | 20.75 |
| Sheets No. 27 | 60.00 | 61.00 | 64.00 | 65.50 | 65.00 | 64.50 | 63.00 | 60.00 | 62.00 | 62.00 | 61.50 | 63.60 |
| Old Rails | 26.00 | 24.25 | 23.50 | 22.00 | 18.50 | 17.00 | 15.25 | 12.50 | 13.50 | 15 00 | 17.50 | 18.00 |
| Old Wheels | 22.75 | 24.00 | 24.00 | 24.00 | 22.25 | 18.25 | 16.00 | 14.75 | 14.00 | 15.00 | 16 00 | 15.75 |

B. M. G.

---

THE report of the Tennessee Coal, Iron & Railroad Co. for November, made public last week showed a surplus of $75,961, after deducting $54,777 fixed charges, as against $239,047 surplus for November, 1899. For an 8 per cent dividend on the common and preferred stocks for the year about $1,824,000 is required. The surplus of the company for the 11 months ending November 30 aggregates $1,750,768, consequently a surplus of about $73,000 must be shown this month to equal the yearly dividend requirements on the stock.

# THE IRON TRADE REVIEW
AND
## INDUSTRIAL WORLD.

DEVOTED TO MACHINERY METAL-WORKING AND FOUNDRY TRADES AND IRON AND STEEL MANUFACTURE.

PUBLISHED EVERY THURSDAY BY
THE IRON TRADE REVIEW CO.,
CLEVELAND, OHIO.

CLEVELAND: CAXTON BLDG., 268 HURON ST.
G. H. GARDNER, President. A. I. FINDLEY, Editor.

CHICAGO: 1522 MONADNOCK BLOCK. B. M. GARDNER, Manager.
PITTSBURG: 429 PARK BUILDING. A. O. BACKERT, Manager.
PHILADELPHIA: 502 ROTHSCHILD BLDG., WM. D. THOMAS, Manager.

Subscription (strictly in advance), $3 per annum. Foreign Rate, $4. Advertising Rates Furnished on Application.

The Cleveland News Co. will supply the trade with THE IRON TRADE REVIEW through the regular channels of the American News Co.

ENTERED AT THE POST OFFICE AT CLEVELAND, O., AS SECOND CLASS MATTER

JANUARY 3, 1901.


## PERSONAL.

Don H. Bacon, president of the Minnesota Iron Co. for the past ten years, has resigned that position to assume the duties of chairman of the board of Directors of the Tennessee Coal, Iron & Railroad Co., in which capacity he will have the management of all departments of the company's business. Mr. Bacon's mining experience began tweny-five years ago at the Cleveland mine at Ishpeming, Mich. About thirteen years ago he went to Tower, Minn., as general superintendent for the Minnesota Iron Co., and he was successively made general manager and president.

Superintendent J. J. Rupman of the Pittsburg Steel Hoop Co.'s plant at Glassport, Pa., was presented with a silver service by the men in his employ at Christmas.

David A. Wise, engineer of construction at the Bessemer plant of the Republic Iron & Steel Co., at Youngstown, O., resigned this week and accepted a similar position with the Youngstown Iron, Sheet & Tube Co.

Superintendent Harry E. Rice of the Waukegan, Ill., plant of the American Steel & Wire Co., has become assistant general manager of the Washburn & Moen plant of the American Steel & Wire Co. F. C. Gedge of Chicago, assistant manager of the Chicago district, succeeds Mr. Rice. Mr. Gedge was formerly superintendent of the Anderson, Ind., plant of the American Steel & Wire Co.

Captain Wm. J. Richards succeeds Captain Bennett as superintendent of the Corrigan, McKinney & Co. mines on the Menominee range, Lake Superior.

J. W. Holmes, manager of the United States Cast Iron Pipe & Foundry Co.'s plant at Bessemer, Ala., has resigned his position and will be succeeded by V. Ferguson of Columbus, O.

De Courcy May has been appointed general manager of the New York Ship Building Co., Philadelphia. He was general superintendent of the Dickson Mfg. Co., Scranton, Pa.

Emil Swenson, after five years of continuous service as manager of the Keystone Works of the American Bridge Co., formerly operated by the Carnegie Steel Co., has retired from the management of the plant. He was remembered by the employes of the plant with a watch, chain and charm.

J. P. Luce, formerly cashier of the Lalance & Crosjean tin plate works at Harrisburg, Pa., has been apointed manager of the mill, to succeed Enoch Sanford.

Will L. Hayes resigned his position as superintendent of the Newburg wire mill of the American Steel & Wire Co., to take an active part in the business of W. J. Hayes & Sons, bankers. He is succeeded by Charles R. Putnam, who has been forman at the mill for a number of years. Mr. Hayes entered the employ of the Cleveland Rolling Mill Co. 22 years ago, and has steadily advanced. He chose the operating department rather than the office and has devised a number of mechanical improvements since he has had charge of the wire mill.

Walter Rachals, late assistant engineer at the Ohio works of the National Steel Co., at Youngstown, O., has been appointed to succeed Marvin A. Neeland as chief designing engineer of the company. The latter resigned to become general manager of Wm. Tod & Co., Youngstown, O.

### Probable Advance in Plates—Pittsburg Freights.

(*Special Telegram.*)

PITTSBURG, PA., Jan. 2.—A meeting of the steel plate manufacturers of the country will be held in New York City tomorrow. It is probable that another advance will be made in the price of plates.

A meeting of the freight traffic managers of the railroads entering this district will be held in New York tomorrow and it is probable that the much promised reduction in domestic rates to the east will be made, and a lower rate on iron and steel products for export established.

### Strike of Structural Workers.

(*Special Telegram.*)

PITTSBURG, Jan. 2.—The structural iron and steel workers of this district, who declared a strike to enforce a demand for an advance from 27 cents an hour to 33 1-3 cents and for a 9-hour work day, received a request last night for a conference with President Roberts of the American Bridge Co., to be held at New York. A committee will go to New York at once for this purpose. Other local concerns affected by the strike have not yet asked for conference with the strikers. As a result of the strike considerable big work is tied up, although the Carrie furnaces of the Carnegie Steel Co. will not be seriously affected, the structural steel work being practically completed.

### Structural Steel Mill at South Chicago.

It has been announced that the Illinois Steel Co. will build a structural steel department at its South Chicago plant. This, with repairs and other improvements, will cost $1,000,000, and will increase the number of employes to over 8,000.

### Obituary.

Evan P. Warner, secretary and treasurer of the Lafollette Coal, Iron & Railway Co., and superintendent of the Tennessee Northern railway, died at Knoxville, Tenn., Wednesday, Dec. 26.

William Westlake, the inventor, formerly of Chicago, died Dec. 28 at his residence in Brooklyn, N. Y. Death was caused by a nervous collapse superinduced by the grip. Mr. Westlake had accumulated a large fortune, and was the owner of considerable real estate in Chicago and Brooklyn. Recently he had been working on a smoke consumer, which he had not perfected when illness intervened. Mr. Westlake had taken out over 300 patents. In the series were the Westlake car heater, the loose globe lantern, the oil cook stove, and the stove board. Mr. Westlake was born in 1831 in Cornwall, England. His most recent connection in Chicago was with the Adams & Westlake Mfg. Co., from which he sold out fifteen years ago. His first venture in Chicago was the starting of a railway supply works in 1861.

John R. Peters, of Georgetown, Pa., died at his home, Sunday morning, Dec. 30, aged 82 years. His contributions to scientific journals during the past year did him great credit despite his advanced age. He invented devices used in the mining of iron ore and many other improvements.

A decision has been handed down by the United States Circuit Court of Appeals, Eighth District, in the patent infrngement suit brought by Horace T. Brown against the Metallic Extraction Co. The Brown patent covers improvements in ore-roasting furnaces, of the double-deck type. The Circuit Court of the United States for the District of Colorado decided that there had been an infringement of the Brown patent and the Metallic Extraction Co. appealed The decision just given affirms the finding of the lower court

## PRESIDENT FOX ON THE CHICAGO CONFERENCE.

In our last issue we gave a letter from H. W. Hoyt, of Chicago, president of the National Founders' Association, commenting on the recent arbitration and conciliation conference at Chicago. From President Fox, of the Iron Molders' Union, who was also asked for an expression as to the practical outcome of the conference we have the following:

Any conference or meeting in which representatives of employers and employes are brought together for an interchange of opinions or a discussion of questions vitally affecting their interests or relations, cannot be without some good results. Agreement may not follow as a result of the meeting but still the meeting itself must inevitably have some educational value and perhaps will pave the way for a better understanding of mutual interests.

Speaking more specifically of the work of the Civic Federation at its recent meeting in Chicago, I am of the opinion that in the discussion of the broad question of arbitration and in securing opinions of diverse interests upon it, it has already done something practical. It has demonstrated beyond peradventure that compulsory arbitration is viewed with disfavor and is deemed impractical by both the managing and the working forces of industry in this country. It has further demonstrated that there is a general trend towards conciliatory measures in the adjustment of disputes that arise between the workmen and the employer, at intervals, in every branch of industry, and a disposition on both sides to avoid irritating cessation of employment and strikes. The striking unanimity of sentiment in favor of conciliation and voluntary arbitration is in itself a valuable object lesson and one which, it is earnestly to be hoped, will not be lost upon those who have not yet sought to test their efficacy.

I do not yet see how anything of a practical character, other than the great educational value it possesses, should be expected from the report of the committee appointed by the Civic Federation to crystalize the sentiments of the meeting. But with a number of intelligent thinkers from all classes laboring to promote a better understanding of the respective rights of capital and labor and endeavoring to devise means which will prevent a clash in the interpretation of these rights, he would be bold indeed, standing on the threshold of a new century, to say that nothing of a practical character will eventuate. The committee can at least impress upon all with whom they individually come in contact the necessity for treatment before a rupture occurs in an industrial dispute; it can impress upon both sides the necessity for a strict regard to responsibilities and the desirability of the utmost discipline among their respective forces. And can it not, with the experience of so many at its disposal, outline a form of agreement which, without regard to technical detail, would most readily adapt itself to the application of conciliatory methods or voluntary arbitration in the disputes of specific industries? No general committee can hope to do more than outline such a general plan, the details must be left to those who alone are conversant with the needs and peculiarities of the industry to which the general plan is to be adapted. If interest be preserved there can be no doubt that the agitation will have a beneficial effect upon the relations between employers and employes in this country.

The absence of any declaration in favor of organization of employers can no more be construed as indicating opposition to such organization, than the absence of any declaration in favor of organization of workmen can be construed as opposition to trade unions. In my opinion both are essential to the fullest success of any comprehensive and effective scheme for the operation of conciliatory methods or of the voluntary arbitration of disputes. I have no fear, as a trade unionist, of any organization of employers in an industry. If it is rightly constituted and animated by the principles of justice and fair dealing it will be of benefit to the industry and improve the conditions of all interested; if otherwise constituted, it may do a great deal of temporary injury, but it cannot live nor permanently subdue the aspirations of organized labor. But, and I desire to emphasize it with all the force at my command, the success of the efforts of the associations of employers and workmen engaged in an industry is contingent upon the measure of recognition the one accords the other. It is of mutual interest that each should be maintained in its complete integrity, that it should be enabled to establish and preserve the greatest possible amenability to discipline among its members and cultivate to the fullest degree the sense of their responsibilities. To bring about such a consummation each association should seek to encourage the growth of the other and to do nothing to retard it or weaken its power for good. A prerequisite of voluntary arbitration or conciliation is organization. Without it, we can do nothing. Is it not apparent then, that they, who, while professing their belief in the peaceful arbitration of trade disputes, antagonize or obstruct organization in the industrial field, are recreant to the faith they profess?

MARTIN FOX,
President Iron Molders' Union of North America.

### Pennsylvania Steel Co. Reorganization.

Plans for the reorganization of the Pennsylvania Steel Co., with plants at Steelton, Pa., and Sparrows Point, Md., owning all of the stock of the Maryland Steel Co., and Sparrows Point railway and 50 per cent of the capital stock of the Juragua Iron Co., Ltd., owning and operating iron mines in Cuba. will be submitted to the stockholders in the very near future. Of the $20,500,000 preferred stock to be issued, $6,500,000 will be for the retirement of the outstanding preferred and common stocks of the Pennsylvania Steel Co., $2,000,000 for the retirement of a like amount of the 6 per cent bonds of the Pennsylvania and Maryland Steel Co., $4,000,000 for the acquisition by purchase or otherwise, of the Cuban Steel Ore Co., of manufacturing plants or other enterprises, and $8,000,000 for providing funds for working capital for improvements at Sparrows Point and at Steelton, and for such other improvements as may be deemed advisable. A syndicate has been organized to purchase from the company the $10,000,000 preferred stock, the proceeds of which will retire $2,000,000 outstanding 6 per cent bonds, and provide the $8,000,000 cash required for additional working capital and for the improvements and extensions proposed. The offer to the present stockholders will be, for preferred stock, 100 per cent in new preferred stock, and 50 per cent in the common stock, and for common stock 100 per cent in new preferred stock.

### Cambria Steel Co. to Make Steel Cars.

The Cambria Steel Co., of Johnstown, Pa., announced last week its entrance upon the manufacture of steel cars, by accepting a contract for the construction of 500 gondola cars for the Philadelphia & Reading railroad. The company has been experimenting with various constructions of steel cars for some time and plans for a rolled steel car have been prepared by L. M. Slack, of the Drexel Railway Co., of Chicago. The cars, however, will not be made of pressed steel but from regular structural shapes and will be slightly heavier than the pressed steel type.

Although the Cambria Steel Co. is not adding to its Gautier plant, there is room for further structural mills at the new Franklin plant now under construction. This plant will contain seven open-hearth furnaces of 50 tons capacity each, which will later be increased to ten. In addition a universal plate mill will be erected and slabbing and blooming mills are already under way.

---

A convenient desk pad circular comes from the H. C. Frick Coke Co., Pittsburg. The company's 12,500 ovens have a daily capacity of 25,000 tons or 1,300 cars.

---

The Crucible Steel Co. of America will begin work shortly on the erection of twelve 40-ton furnaces and a blooming mill, the plant to be located in the Pittsburg district. The Garrett-Cromwell Engineering Co. of Cleveland are the engineers.

---

*Power and Transmission*, now published quarterly, appears in new cover and form with the January issue, which is well illustrated and full of interest.

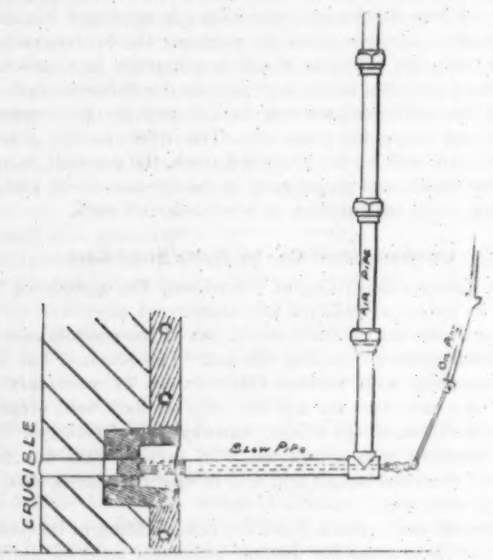
---

The S. Obermayer Co., of Cincinnati, sends its holiday greetings to its customers by issuing a bill of lading, which departs from the usual foundry supply specifications, and describes the goods shipped as "an assorted car of good wishes, prosperity, and happiness," forwarded by the Twentieth Century Transportation Co., U. R. Goodfellows, agent.

## HARTMAN IRON NOTCH FOR BLAST FURNACES.

Some years ago when a certain blast furnace with the old style fore hearth and tymp worked badly much difficulty was found in getting the cinder out of the crucible. A long hole had to be drilled across the fore hearth under the tymp to get at the cinder. This hole would freeze up if the cinder was cold and sluggish, requiring the men to drill another hole. Permission was asked of the proprietors to dig a hole in the side of the furnace and put in a closed front to draw the cinder through. Conservatism replied, "No." A large furnace fire brick was selected and a hole of 1¼-inch diameter was carefully drilled through it. The block was inserted under the tymp and the cinder drawn through it. This fire brick block lasted for some days. It was stopped with a plug of clay and opened by hand, the clay being picked out carefully with a small steel bar. The remarkable thing was the length of time the block lasted. The conservatism of the proprietors was overcome, and this furnace has a closed front to this day.

Following up this experiment, a trial was made of a refractory iron notch. This ran well for 72 hours, casting 25 tons every eight hours. It was simply inserted in the tapping hole and packed tight. The opening was 3-inch and stopped with clay. The iron ran steady, and the opening retained its size, so that there was no breaking out or flooding of pig beds. When cinder came the hole was stopped with a plug of clay. At the end of three days there was no appreciable wear of the notch, but that night the keeper drove the bar through the notch and broke it. Experiments made since show that with




proper care these notches last, and wear away so slowly that a week's work can be had without changing them. As they are not expensive, and are easily replaced they pay well, but the keeper must be educated to use them.

To open this iron notch a blowpipe is used. The plug to stop it is of pressed charcoal which is refractory so long as air is kept from it. The blowpipe soon burns a hole through the plug and reaches the iron, which coming in contact with the hot hole is kept fluid and prevented from freezing in the hole. Outside of the iron notch is placed a notch breast of refractory material built firmly in the wall of the crucible which forms a socket for the iron notch. This breast holds the walls, and in the event of a notch breaking or giving way it prevents a rush of iron. To replace a notch the iron and cinder are run off, the hole in the breast is cleaned out carefully and a new notch inserted. No water is used in the notch, but the usual water surrounding the iron hole in the dam is required. The breast is cooled artificially by a new process that is non-explosive.

Watching a casting as at present, the rush of iron in large volumes as the hole wears out, the blowing and wasting of iron burned to sparks with its loss, the heating and melting of walls at the notch by the passing volumes of iron cinder and gas—all these enlarge the hole. A marked contrast will be found with the smaller volume, and steady quick flow from the refractory notch, which does not melt the walls or cause the hole to give away. When cinder shows on the iron, blast is slacked, the charcoal plug is inserted and the iron stopped. As the cinder notch is for the cinder, all the cinder should go out of it. The deeper bath of cinder gives the iron better protection and takes up the sulphur with other impurities from the iron. To use one of the Hartman notches requires that the notch be properly treated, otherwise the designers consider it better let alone. The accompanying cut shows the arrangement of parts. The notch is manufactured by the Hartman Co., of Philadelphia.

## GREAT LOCOMOTIVE AND CAR-BUILDING RECORD.

During the year 1900, all the contracting locomotive works in the United States (that is those outside the railroad shops), 15 in number, will have built 3,153 locomotives. This is the largest number ever built in one year and is 680, or 27.5 per cent more than in 1899, when the record was also broken. In fact, the increase this year will be nearly 14 per cent greater than the increase of 1899 over 1898. Of the 3,153 locomotives that will have been turned out this year, 545, or more than 17 per cent will be compounds. In 1899 the output of compound locomotives was 339 or nearly 14 per cent of the total output; and in 1898 the number of compounds was 373, or 20 per cent of the total. The figures for the year include 102 geared locomotives and 21 compressed air and 48 electric locomotives. The number of locomotives that will have been built for export this year is 505, or about 16 per cent of the total output. This is nine, or not quite two per cent less than in 1899, when 514 engines were built for railroads in foreign countries. In 1898, 554, or 30 per cent of the total, were sent abroad; and in 1897, 386, or 31 per cent. In 1896, 309, or 26 per cent were exported. The following table shows the total number of locomotives built each year for the past 10 years:

| | | | |
|---|---|---|---|
| 1900 | 3,153 | 1894 | 695 |
| 1899 | 2,473 | 1893 | 2,011 |
| 1898 | 1,875 | 1892 | 2,012 |
| 1897 | 1,251 | 1891 | 2,165 |
| 1896 | 1,175 | 1890 | 2,240 |
| 1895 | 1,101 | 1889 | 1,860 |

At present the outlook is that 1901 will at least equal 1900. Some of the locomotive builders have orders enough on their books to keep their works busy for from five to nine months hence and judging from our news columns there is no immediate prospect that the demands of the railroads for new motive power will be less than a year ago.

The total number of cars that will have been built by the car building works in the United States during 1900 is 124,106. This, of course, does not include the cars built by the railroads in their shops. Of the 124,106 cars, 113,070 are freight, 1,515 passenger, and 6,091 street cars for use in America; and 2,561 freight, 121 passenger, and 748 street cars for export. All of these figures are official, except in the case of a few small builders, the output of which we have carefully estimated. Last year the total output of these same works was 123,893 cars, divided as follows: 117,982 freight, 1,201 passenger, and 4,710 street cars for use here; and 1,904 freight, 104 passenger, and 296 street cars for export. The extension of the steel car industry is shown by the fact that of the total freight cars that will have been turned out this year 14,464 were all steel; 447 of these were for export. Last year, the total was 10,500, while in 1898 but 2,700 were built. In addition, 4,140 of the wooden freight cars, for domestic use, had steel underframes. During the coming year we may expect to see a still greater increase in the use of steel cars, as the Pressed Steel Car Co. already has orders in hand for several thousand steel cars not included in this year's output, and four other concerns have lately entered actively into the work of building steel cars. More cars for passenger service will probably be built in 1901 than in 1900, judging from the present activity in that direction.—[Railroad Gazette.

The American Steel Hoop Co's. Youngstown, O., plant is about sending a large consignment of iron and steel bars to Bombay, India. The same plant has on hand an order for small beams for Buenos Ayres, Argentina.

# Lake Superior Iron Mines in 1900.

BY DWIGHT E. WOODBRIDGE.

By far the most significant fact in connection with the work of iron miners along the Lake Superior ranges for the year just closed has been the meagre result of explorations. All through the earlier part of the year, and continuing in the case of many of the larger concerns through the entire 12 months, there has been such a search for ore deposits as the lake country had never seen before. Not alone in the money spent, which has been on a scale not before equaled, but in the thoroughness of the work, in the scientific system under which the search has progressed, and in the territory covered, has this department of the mining industry excelled all previous records.

There never was a time in the history of the region when so many heavy concerns were interested in explorations as in the past year — concerns not in the business for speculation, but interested in securing additional ore supplies for their own consumption, concerns that have been able to call around them the highest technical skill, backed by the most perfect appliances and ready to put any amount of money into any prospect that seemed favorable. With such an equipment there should have been results, if it is possible to attain them. But the new ore found, especially on old ranges, is not commensurate with the labor and expenditure. Even on the Mesabi the results have been disappointing. The Mesabi has shown one thing, and that is its reserves of low grades and undesirable ores are such as to assure a long continuance when their extensive use becomes necessary. The high grade deposits found there in the year have been very few. Some previously known ore bodies have been enlarged and extended by further and more careful explorations; some mere prospects have become good properties; but the consensus of opinion among well posted mining men who have tested that range as thoroughly as any is that by far the greater part of the ore has been found.

### Explorations on the Canadian Side.

It would now appear that the most inviting field for exploration in the Lake Superior country is north of the lake in Canada. So far, with but few exceptions, the explorations carried on there have not been satisfactory, and many bitter disappointments have been met during the year by explorers in Canadian fields. As a general thing the ores found there are undesirable, for one reason or another. They may be titaniferous, some are thin blankets, some are much mixed, and some are otherwise unfit for the purposes wanted. The vast extent of the undeveloped and almost unexplored territory north of Lake Superior, from the vicinity of the Sault on the east to the Rainy Lake district on the west, is such as to make any predictions as to the future of this territory absurd, and to recall the proverb, that "fools rush in where angels fear to tread." There have been two or three explorations in this area that have arrived, so to speak. These are the now noted Helen and neighboring deposits of the Michipicoten range, and the Atikokan region, one near the east end and the other clear to the west of the ore bearing district. The known deposits of both these ranges are now in the hands of strong parties, the Michipicoten under the almost complete control of Mr. F. H. Clergue and his associates, the Atikokan under option to an American steel company and almost sure to be taken by it in the early spring.

The Helen mine is no isolated deposit. The range of which it is the most westerly opening and outcrop is traced by the Clergue interests for some 50 miles, and various ore bodies are known to exist upon it. While the ore of the Helen is a brown, that of the Josephine, the only other deposit that has been explored to any considerable extent, is a fine red ore, much like many of the Vermillion ores in appearance. It is believed to run better in iron and lower in phosphorus than Helen, which is not entirely satisfactory. Since the commencement of shipments from the Helen it has sent out about 62,000 tons, almost exactly the quantity shipped by the Vermillion range during its first year. The management has installed an overhead conveyor system and runs its ore to a large Gates crusher, and thence 12 miles down hill to a dock built by it during the summer. The dock is a new departure from all lake precedents, and further trial of it will be necessary to show its advantages for the work. The expectations of the management are that the mine will mine and ship next year not less than 600,000 tons, and it may reach this figure.

At the Atikokan there has been a little work done during the year, enough to show a large body of magnetic ore of a high grade. This ore is exceedingly hard and dense, and runs very high in iron and so low in phosphorus as to be valuable. There is a sharply rising hill, some miles long, and averaging about 300 to 500 feet wide. On the top of this the ore outcropped in three parallel lenses, one about 40 feet wide, the others narrower. At the point where a tunnel has been driven through the ridge this is about 150 feet high. The tunnel has shown these three ore lenses to be continuous at least to the level of the surrounding ground, and to be persistent to that depth in their dip and quality. The formation is such that a very considerable depth is probable. As to the full extent of the range nothing is definitely known, but there are not wanting indications that it is quite important. A leading American steel company has bonded the property and is now arranging to begin explorations on a more ambitious scale, and will install crushers. The projected Ontario & Rainy River railway runs at the base of the outcrop, crossing the Atikokan river at this point.

Nearly 100 miles east of this deposit are the explorations of the Mattawin range, where the Ontario government has been drilling with a diamond bit for months. Nearly 2,000 feet of cores have been taken out. Common report is that the ore is of a very valuable grade, but the indications are that the facts are exaggerated. There are a number of locations at this point, where the ore is exposed, in both hematite and magnetites, but unless the present result is of a very different character from that of some years ago in deposits are not of great importance.

There are known to be large iron ore showings in Hunter's island, and along the Seine river, all in western Ontario, near the Minnesota state line, but these have not been sufficiently tested to show any great value. On the north shore of Lake Superior, close to Thunder bay, there was early in the year some excitement over ore finds there, but the result of the explorations has been meager, up to date. There are reported discoveries along the east side of Nepigon river and lake, and it is unquestionable that the outcroppings there are strong. As yet the value of the finds is not known to any one.

### New Mines on the Mesabi Range.

New producers among the mines of the lake country have been few this year. On the Mesabi range there are, naturally more than elsewhere. Here the Clark, Stevenson, Spruce and Union mines are new, varying from an output of 64,000 tons at the Clark to 8,300 at the Union. All four are large properties and will make a great showing another year, when their development has proceeded far enough to permit big mining without injuring the properties. The owners of the Clark, the American Mining Co. (A. S. & W.), propose to win not less than 175,000 tons in the year, and they are developing the mine to this end. Its ore is a desirable, coarse Bessemer. The mine is an underground property. The Spruce, which is a property belonging to the Kimberly interests, has ore reserves of 7,000,000 tons or more, practically all Bessemer of a good character. It produced this year 61,000 tons. Its output in 1901 will probably be large. The Union is a later property, and the commencement of development was not until the later part of the year. Since work was begun the mine has been developed so that it is hoped to mine 200,000 tons during the coming season. It is possibly the most desirable Bessemer ore yet opened into on the Mesabi range. It belongs in fee to the Minnesota Iron Co., under a recent purchase of the lands of the C. N. Nelson Lumber Co. on the Mesabi range, though the mine is operated under a lease previously given to the Wyoming Investment Co. for 25 cent royalty. This lease has been purchased by the Republic Iron & Steel and the American Steel Hoop companies for a bonus of $400,000.

The Stevenson mine is the most westerly property in the range. Its existence has been known for years but it was not until this year that preparations were made for opening it. Corrigan, McKinney & Co. are the lessees, and their royalty is but 12½ cents a ton for a large output, increasing to 17

cents for smaller productions. They are busily stripping the mine for steam shovel production and will also have three double-compartment shafts, which will make their possibility of output very high. It is probable that a large production will be made next year, especially as the lowest royalty rate does not attach without a production of 500,000 tons. The Stevenson has an ideal location for an open pit mine, and will probably not be troubled by floods during its career. Active preparations are being made for the opening of the Sharon Steel Co.'s Mesabi mine, and a large area is being stripped preparatory to mining by the milling process next year. It is a fine body of ore and is important in its size and character. There will probably be other mines open during the year but none are now in active preparation.

**New Work on the Old Ranges.**

On the Vermillion range exploration during the year has been carried on at heavy expense, and a few properties may perhaps warrant the prediction that they will become mines later, but there are no new shippers this year. It is said that $300,000 has been spent in explorations this year. The Sibley, last year an exploration from which 5,000 tons was shipped, has done little this year and is not increased in immediate importance. Savoy, then a new property, is now a large and excellent mine and this year increased to a production of 170,000 tons.

On the Gogebic old Mikado has been rejuvenated and there was mined from it about 60,000 tons. Comet, also an old and abandoned property, has been revived and is now a mine. The same is true of several other properties at the east end of the range. The Pike option is about the only really new ore property of the Gogebic range, and its future is not entirely settled. At Puritan, Ironton and Federal and at Valley and Jackpot ore reserves have been increased.

On the Marquette the Barasa, Beaufort, Titan, Webster and Bessie have been opened and operated to some extent. Most of them are old and abandoned properties, and some of them are now abandoned again. In fact not one of them is just now active, though next spring will probably see them so, considable ore having been opened into at some of the list.

On the Menominee, the Cuff, Hilltop and Michigan, and the Iron River and Lac Fumee properties of the Oliver Iron Mining Co. are what may be called additions to the list of mines, though as a matter of fact they should hardly be credited to this year. There are also some explorations that will do to watch, and from which mines may be developed the coming year.

**Mesabi Range Reserves.**

Ore reserves held on the Mesabi range by such concerns as the Federal Steel, Rockefeller and Carnegie interests are very large and comprise by far the greater share of reserves in the lake region, so far as the southern shores are concerned, at least. The Minnesota Iron Co., whose stock is held by Federal Steel, is a very large holder of undeveloped lands along the range, and is particularly strong in the townships that are richest in desirable Bessemers. In town 58-17 it has an immense holding, and while much of it is in the granite that dips down toward the southwest corner of the township, a large share is in especially desirable locations, and is supposed to contain many million tons of ore. Some of its undeveloped properties the company has been exploring of late and in single tracts it has found large deposits. The Virginia exploration, the Pittsburg lands, the C. N. Nelson lands bought during the present year for $1,000,000, the Iron Chief and Monarch lands, and other extensive holdings contain ores that will continue its mineral operations in full tide for more years than the present stockholders will be interested in. This company owns the fee title to the Wyoming lands, which include the Union mine, now being opened, and the Kimberly and Humphrey tracts in the northwest portion of 58-17. Its holdings extend far beyond the western line of the associated Duluth & Iron Range road, and an extension of that system is planned.

The Rockefeller interests are holders of enormous ore reserves in the western portions of the range, with very important properties elsewhere. Through agents the company has interests in large and widely scattered tracts in 58-16, is an important holder in 58-17 and -18, and has within the past year or two secured by purchase and lease millions of tons of ore yet unopened in 58-19 and -20. In the Hibbing district the ore reserves in opened and unopened mines are very great, and the company has an important tonnage under state contracts that may not be mined for years to come. This company holds the Roucheleau properties in 58-17 and elsewhere, where there is much ore and has several tracts recently bought in the eastern and central portions of 58-20 where immense deposits are known to exist. Much of the ore held by the company is under working lease to others, but by special contract provides tonnage to the company's railroad. It is now operating on its own account but a small portion of its ore bodies, the list including the magnificent Adams, the Duluth, and the Hibbing group of half a dozen mines whose ore bodies are of enormous extent. The ore mined this year by the company was but about 1,365,000 tons, though its road hauled to dock nearly 3,900,000 tons.

The Carnegie reserves on the Mesabi are very large, as is well known to the trade at large. Not only large but easily mined and of varied character. Much of the more easily mined ore is of rather a disappointingly low grade, though improvement is hoped for later. The mines now open are the Oliver, Lone Jack, Ohio and Norman, in the Virginia district, and the Mountain Iron. Besides these the company holds the Stevens, Sheridan, Shaw and some considerable acreage of undeveloped lands and is acquiring more, and it holds the fee to the Sparta mine, worked by Pickands, Mather & Co. Its Virginia group is largely non-Bessemer and much of that ore is quite fine and dustlike. The company has holdings in connection with other companies that are of much importance, and will enter upon some of them shortly. Its great and desirable reserves of high grade Bessemer are in the Vermillion range, where the Pioneer group at Ely is a magnificent deposit and from which quantities of ore will be mined for many years to come.

---

**British Furnacemen Following American Practice.**

There has been a disposition on the part of some English writers on the subject, to defend British blast furnace practice with its "long life and slow life," as against American hard driving and large outputs, as accompaniments of "a short life and a merry life." However, it is to be observed that American engineers have in hand the building of several furnaces in England, and according to the following from the London *Iron and Coal Trades Review* there is a very general movement to secure equipment that will yield the large outputs now the rule in the United States:

"A great deal has been done during the last two years to improve the blast furnace plants of the United Kingdom, more especially from the point of view of a larger productive capacity. At the works of Bolckow, Vaughan & Co., Messrs. Bell Brothers, the North Eastern Steel Co., the Mossbay Hematite Iron Co., and other large pig iron making companies, the blowing power has been, or is being, so largely improved that the production of pig iron in a given time has been, or is likely to be, increased by from 30 to 60 per cent, according to the conditions. In the majority of cases the pressure of blast has been increased from about 6 to 10 or 12 lbs., but the Moss Bay Co. are aiming at a pressure of 20 lbs., in the magnificent new engines now being installed at their Workington plant, which will probably mean an increase from 600 to 1,000 tons per furnace per week. At the Askam works of the Millom Co., in the same district, nearly £65,000 has lately been expended in the construction of a blast furnace on the most modern lines, which can do more than 1,000 tons per week, and we believe that at the Derwent works of Charles Cammell & Co. 1,000 tons per week per furnace is now pretty regular practice. These figures are, of course, much behind the most modern American practice, but they are a vast improvement on the records of a few years ago, and give promise of better things to come."

---

LARGE as were the dividend and interest disbursements at the beginning of 1900 those for next week promise to exceed them. It is estimated by good authorities that the January distribution on these accounts will reach $120,000,000, nearly $20,000,000 more than the total for January of the present year, which thus far has been the record month. The increase in dividends is from $35,000,000 in January, 1900, to $50,000,000. Interest on bonds amounts to about $70,000,000 as against $65,000,000 at the beginning of the present year.

## A LARGE WESTINGHOUSE ENGINE.

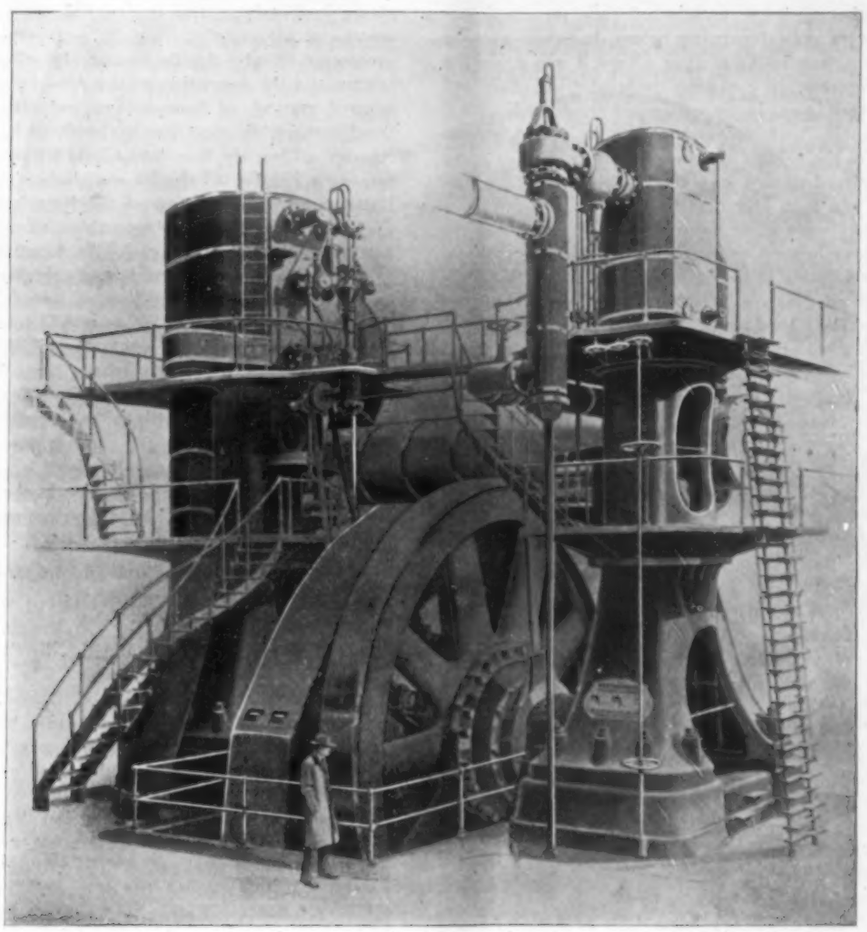
A number of unusually large steam engines have been erected recently in the new extension to the Westinghouse Machine Co.'s plant at East Pittsburg, Pa. Conspicuous among these are two huge compound Westinghouse-Corliss engines of 5,000-h. p. each, built for the Kings County Electric Light & Power Co., of Brooklyn, N. Y. These twin engines, which have been erected temporarily on the floor of the new shop, are of the vertical type and the first impression the visitor gets is that of their great height. They rise over 35 feet from the floor and the top of each is reached by curved stairways, with brass hand-rails. Iron platforms, bolted to the frames of the engines, enable the attendants to reach quickly any part of the exterior. Counting these platforms as stories, the tops of the engines, reached by ladders from the top platforms, may be said to be four stories above the ground.

Each engine comprises two vertical cylinders erected side by side on massive frames, bolted to ponderous bed plates. In each there is room left between the two cylinders for a Westinghouse generator, which will furnish current for light and power. The revolving part of this generator is mounted directly upon the steel shaft of the engine, and is firmly bolted to a very heavy fly-wheel. A better idea of the size of the machines may be obtained by noting that the fly-wheel of each has in the rim alone 100 tons of metal, that it is 28 feet diameter, and that the shaft which carries it is 39 inches in diameter. It is not feasible to build so large a fly-wheel in one piece, and it is accordingly built in segments, keyed to each other and all bolted to the hub.

In addition to the great mass of the engine which is visible above the floor, a considerable depth below the floor is necessary to allow space for the fly-wheel and the lower frames of the great generator. Under all, when the machines ar permanently installed, will be foundations of concrete. The overall length of each of these engines is approximately 40 feet. The engines are of the vertical cross compound condensing type, especially designed for driving alternating generators mounted directly on the shaft of the engine. The engines have a nominal capacity of 4,000-h. p. and will carry successfully overloads of 7,500-h. p. The principal dimensions are as follows:

Height from floor line to top of cylinders, about 35 ft.; length along the shaft 38 ft. 6 in.; width 28 ft.; diameter of high pressure cylinder, 46 in.; diameter of low pressure cylinder, 86 in.; stroke, 60 in.; number of revolutions per minute, 75; steam pressure, 170 lbs. The diameter of the shaft in the center is 39 in.; diameter of shaft at bearings, 34 in.; length of each bearing, 60 in.; total weight of the shaft without crank-cheeks or fly-wheel centers, about 75,000 lbs. The shaft is of hydraulic forged open-hearth steel, having a hole its entire length 16 in. in diameter. The fly-wheel is very massive, having 100 tons in the rim; diameter of wheel 28 ft.; velocity of rim 6,600 ft. per minute, or practically one and one-quarter miles. The bearing shells and caps are water-jacketed, as are also the cross-head slides. The generators of the Westinghouse engine type, have an output of 2,850 K. W. each, giving a 3-phase current of 250 amperes in each phase, at 6,600 volts, with 3,000 alternations per minute. They have separately excited fields and operate in multiple with other Westinghouse units.

Building engines of such great size calls for unusual shop and foundry facilities and even their shipment is by no means an insignificant problem. For instance the two great bed-plates of one of these engines weigh over 43 tons each, and as they are cast complete in one piece they are difficult to handle. For transporting these castings to Brooklyn the Pennsylvania railroad has constructed special steel cars. Each of the fly-wheel segments is a car load. The cylinders are also ponderous pieces of metal.



A LARGE WESTINGHOUSE ENGINE.

The company for which these engines were built was chartered in 1890. By January of 1898, 82 miles of conduit had been laid, all done under the most exacting specifications. In 1898 the Gold Street Station of the company was begun, and this was equipped with Westinghouse generators. Both this and the new Bay Ridge Station are of modern fireproof construction, with foundations of concrete on top of piles. Landing docks have been built close to the stations, for handling coal and ashes and the most approved modern station methods have been adopted. The Bay Ridge Station to which the new engines are to be shipped has already in use about 5,000 horse power of generating apparatus, and when the two new 5,000 horse power units are installed it will be one of the largest in the country. Cyrus Robinson, one of the engineers of the Westinghouse Machine Co., was the designer of the engines.

# The Pittsburg Iron Trade in 1899.

Despite lower prices and smaller profits than those of the previous year, the result of the past 12 months is viewed with general satisfaction by the iron and steel interests of the Pittsburg district. As 1899 was a year for record breaking prices, the past year goes down in history as one remarkable for a meteoric fall in prices for all iron and steel products from the abnormally high altitude of the year preceding. So auspiciously did the year open that no one dared venture a prophecy that within less than six months many values would be cut in two, and that mills instead of refusing business would be eagerly competing for it to keep in operation from day to day. During the early months of the year mills and furnaces were being operated at their utmost capacity and the outlook seemed full of promise. The eagerness of buyers that characterized the second half of 1899 was not in evidence to any marked extent during the first few months of the year, and instead of prices going higher as some anticipated they remained stationary. Producers upheld existing prices, however, as long as orders were on their books and for a time it was a waiting game. In this instance the consumer came off triumphant and prices began to seek lower levels with rapid strides. Even before the memorable April reduction made by the American Steel & Wire Co. the market was weakening, and what some had suspected proved to be a fact, the market finding its lowest level within less than four months.

Repeated efforts were made from time to time to stop the decline, but it was beyond artificial control and all such attempts were immediately followed by still lower prices. Only after the market on nearly all products became an open one, and prices found their level as the result of open competition, did consumers begin to regain faith. Then, the buying movement once started, prices became more stable and began to recover slowly. The late summer and early autumn saw the placing of a very large amount of business in finished lines, and to such an extent did consumers regain faith in existing conditions, that they were not daunted by the pendency of the national election, but contracted for months ahead long before the result was known. On the eve of election prices were stronger than for several months, and following the favorable result another impetus was given the buying movement. With all its vicissitudes the year which has just closed finds the market in a very satisfactory condition. Prices are not inflated, and manufacturers are only making fair profits. Finishing mills are well filled up into the new year, while furnaces operating on foundry and forge irons have their output booked for several months ahead. One of the most encouraging features of the situation is the fact that the most sanguine see no prospect of an early revival of the "boom" prices, the disastrous effects of which are seen in the era of low prices from which the trade is just emerging.

But for the large export demand during the summer months many mills in this district would have been compelled to shut down. With high prices ruling abroad and low prices here, American iron and steel products undersold those of the foreign producers. Large business was done in both raw and finished material and the demand would have continued until the end of the year, but for the refusal of the railroads to make low export freight rates to the seaboard. With better rates the Pittsburg manufacturers could successfully compete abroad even during an era of low prices. After it became apparent that the railroads would do nothing towards giving better rates the Carnegie Steel Co. took the initiative by exporting from Conneaut, O., by water route as an experiment, 4,000 tons of billets and sheet bars. The four vessels that were chartered each took on 1,500 tons of wood pulp at Montreal. All arrived at their destinations safely and owing to the success of the experiment there is little doubt that the company will make further exports from Conneaut, O., in 1901.

### Important Changes in the Year.

Many changes have occurred during the year. The position of the merchant furnaces in the valleys as factors in the steel industry of this district has been lost, the large steel producers having built new blast furnaces to make their pig iron output equal to the requirements of their steel plants. Thus the end of the year finds the majority of the Bessemer furnaces in the valleys shut down. As the result of the various consolidations the Carnegie Steel Co. found that its production of billets was greater than it could dispose of in the open market, and additional finishing capacity has been or is being installed to utilize the surplus production. It will go into bars and possibly hoops and bands.

Prophecies that the past year would see few if any consolidations of iron and steel interests have proved false. The year has been almost as prolific in consolidations as 1899, and the organization of the Carnegie Co., a corporation with capital stock of $160,000,000 and an equal amount of bonds, leads the list in size and variety of interests involved. The projected combination of sheet manufacturers was carried out successfully, resulting in the absorption of nearly all the sheet plants in Pittsburg and the central west. This combination was twice attempted during the year previous and twice its promoters failed. Another successful effort after several attempts was the formation of the American Bridge Co., which secured control of four bridge and structural concerns in the Pittsburg district, together with 20 in other parts of the country. Then the Standard Chain Co. was incorporated, absorbing a number of the largest chain works in this vicinity. Later came the formation of the American Casting Machine Co., consolidating three companies manufacturing pig iron casting machines. Then came the formation of the Crucible Steel Company of America, whose principal plants are located in Pittsburg and the immediate vicinity. The last consolidation involving Pittsburg interests is known as the Pittsburg Valve, Foundry & Construction Co., combining nearly all the large pipe bending concerns of the city. While it seems that there are few interests in the iron and steel trade that remain unconsolidated, it would not be surprising to see further effort in this direction in the coming year. Perhaps nowhere in the country has the consolidation idea found better reception than in Pittsburg, and no city in the country will be so greatly benefited by the larger development of the iron trade that will follow.

### New Construction and Improvements.

The fall in prices has not interfered with the schedule of improvements mapped out by the largest interests, and new plants were erected throughout the district at an expenditure of money never before equalled. The Carnegie Steel Co. leads in the number and value of improvements. At its Duquesne plant, 12 open-hearth furnaces have been built with an annual capacity of 350,000 tons a year. Sixteen soaking pits have been added to this plant and a reversible blooming and one merchant mill have been added to the rolling capacity. The Howard Axle Works were completed during the year, having an annual capacity of 100,000 tons of forged open-hearth and nickel steel axles. The rail mill at Edgar Thomson was improved by the addition of patented cooling tables, resulting in a better wearing rail. The projected hot metal bridge from the Carrie furnaces to the Homestead Steel Works was completed and placed in operation. Nine of the furnaces at Edgar Thomson were equipped with automatic charging devices and a number of the furnaces were relined and enlarged. The two new Carrie furnaces under erection, which will be the largest in the world, are nearing completion and will add about 1,400 tons daily to the pig iron output of the company. Despite the enlargement of existing furnaces and with the addition of the two Carrie furnaces the steel production of the company will still be somewhat greater than its blast furnace output, thus necessitating the purchase of an amount of pig metal annually in the open market. Changes at the Duquesne furnaces are now contemplated, including new engines, which will increase the output. What the new year will bring forth in the line of improvements by this great concern is still in embryo. However, it is more than a possibility that within another year such finished lines as hoops, bands, pipes, tubes and sheets will have been added to the company's products.

Jones & Laughlins Ltd. have also made important improvements. Three of their Eliza furnaces have been rebuilt giving

them a capacity of 600 tons daily, and a fourth, newly erected, will go into blast about the middle of January. This will give the concern a daily output of 2,700 tons of pig iron, including the product of its Soho furnace. The steel producing capacity of their plant is about equal to the blast furnace output and with all finishing mills in operation there is no surplus billet production. During the year great improvements have been made in the structural mills of the plant and a rod mill is being added that will have a capacity of about 300 tons daily. A bridge across the Monongahela river was also rebuilt as a hot metal route from the furnaces in Soho to the South Side steel plant.

The year's record of new construction also includes the following: The plant of the Pittsburg Steel Hoop Co., at Glassport, Pa., with 3 mills was placed in operation. The Mesta Machine Co., at West Homestead, builder of engines and rolling mill equipment, with a capacity of 141 tons daily commenced operation. The McClintic-Marshall Construction Co. has under way a large structural plant on the Monongahela river at Braddock. The Park Steel Co., now absorbed by the Crucible Steel Co., of America, has projected 24 open-hearth furnaces and a 22-puddling-furnace mill at West Elizabeth, Pa. Large additions have been made by the National Tube Co., at McKeesport, Pa. The Standard Chain Co., completed and placed in operation a large plant at Rankin. The plant of the Pennsylvania Malleable Co., at McKees Rocks, with a capacity of 200 tons daily, was started. A plant for the American Axe & Tool Co. is under construction at Glassport, Pa., at a cost of $500,000. At Sharon, Pa., in addition to the Sharon Steel Co.'s plant, there will be built the hoop mill of the Sharon Steel Hoop Co., at an expenditure of $300,000. The plant of the Keystone Car Wheel Co., at Hays Station was completed and placed in operation. At Webster, Pa., the Union Steel Co. has under construction a plant for the production of rods, plain and galvanized wire, wire nails, etc., with a daily capacity of 700 tons. The Carlin Locomotive Works have been placed in operation. The Duquesne Steel Foundry at Kendall Station was completed and placed in operation. The Pittsburg Pulley Co.'s plant, near Grafton, Pa., is under construction and the McKay chain plant is projected at McKees Rocks. A large plant for the American Bridge Co. near Homestead is in the plan stage. Last but not least is the extensive new plant of the American Steel & Wire Co., on Neville Island, one blast furnace of which has been nearly completed.

No other city or district in the country can show such vast expenditure of money for improvements or new enterprises as that represented in the above. That the new year will find capital equally desirous of investing in the iron and steel trades is probable and the additions and improvements to existing plants promise to continue on a large scale.

### The Outlook.

Interests whose wage settlements are made with the Amalgamated Association of Iron, Steel and Tin Workers will not permit a repetition of the controversy which practically closed the mills for three months during the past summer. Immediately after the signing of the scales a movement was started looking toward a settlement while the mills are operating, and such pressure will be brought to bear on the Amalgamated Association in the new year that a non-interruptive clause will probably be embodied in the next scale. The year 1900 closes with lower wages being paid to iron and steel workers than at the same period of the previous year; and to lessen the cost of pig iron production a reduction will probably be made in the wages of blast furnace workers in the valleys early in the new year.

With lower wages, cheaper coke and lower priced ore there is little probability of any great advance in pig iron; and the furnacemen, especially those whose plants are on foundry and forge iron, will be satisfied to have present prices continue. The Bessemer furnacemen on the other hand cannot see a profit at ruling prices and will not generally resume until better conditions exist.

In finished lines the outlook is bright both for a continuation of present prices and for a good spring demand. That the new year will be as profitable to all interested in iron and steel as the one just ended, is pretty generally admitted. To commence the year more than 1,250,000 tons of rails have been booked, while the plate mills in this district have orders on their books for more than 500,000 tons. Bar mills are months behind on deliveries. The Pressed Steel Car Co. begins the new year with orders for 12,000 steel cars.

### Pig Iron.

In unfinished lines, Bessemer iron started on the year with the brightest prospects. The mercha..t furnaces in the valleys were well sold up for the first half of the year and the furnaces of the large steel producers were by no means keeping pace with the steel output of their connected plants. For six-months' contracts the merchant furnacemen received from $22 to $24 per ton for their product, and with the advance on old range ores to $5.50 per ton at lower lake ports, together with $3 furnace coke, all indications were favorable to a continuation of high prices at least throughout the first half of the year. In January, lots of prompt shipment Bessemer iron were sold at $25.25, delivered Pittsburg. In February fully 100,000 tons of iron sold at $24.90, delivered Pittsburg, and in March the sales amounted to 45,000 tons. In April a meeting of the Bessemer pig iron association was held and it was decided to maintain the price at $24.90, Pittsburg, until July 1. During the latter part of this month, however, specifications began to drop off at an alarming rate and many of the largest buyers practically stopped shipment on their iron. During May the sales practically ceased, and quotations were merely nominal. In June the association fixed the price at $20, Pittsburg. There was no buying, however, and these artificial attempts to support the market kept buyers out of it instead of inducing them to place business as was anticipated. In June a number of furnaces in the valleys and several in Pittsburg, operated by large steel producers, went out to stop the piling of iron. The pig iron association again ratified existing prices the first week in July, but the following week at a meeting held in New York, at which the situation was discussed between the leading steel interests and the merchant furnacemen, it was practically decided to declare the market an open one. Efforts were then made between the two interests to reach an amicable agreement by which the Bessemer pig iron production at the valley furnaces and those of the steel producers was to be curtailed for several months, but several meetings resulted in nothing definite being done. During this month sales were made at $17 per ton and in August a lot of Bessemer for malleable purposes was sold at $15. September found only a few of the merchant furnaces in blast with little demand. Prices in the meantime dropped to $13.75, Pittsburg. During October a better demand set in and the total sales approximated 35,000 tons, a greater tonnage than was placed during the preceding six months. Some sales were made during the month at $13.25. The demand throughout the month of November was rather limited, although prices ruled somewhat better. The year closed with little buying and sales averaging $13.50 per ton. The question of a reduction in wages of the blast furnace laborers was taken up, but nothing definite was done, although the new year will, doubtless, bring a reduction.

From $21.50 per ton, delivered, to $13 a ton, is the record made by gray forge iron from January to September. Since the low point was reached a somewhat better price has prevailed, but it is nothing to boast of. With mills and foundries well bought up at the first of the year there was little buying, and as early as February the market showed signs of weakening. In May it had dropped to $18 per ton, and in September $13 was paid for round lots. Throughout the summer months there was practically no buying and mills deferred placing their business on account of the long controversy over the puddling wage scale. In the past three months buying has been somewhat spasmodic, little new business being placed for future delivery and the year closed with the valley furnaces holding iron at $12.50 per ton, or $13.40 delivered, Pittsburg.

Having paid the high prices that ruled the latter part of 1899 for much of their iron for delivery in 1900, the foundrymen of this district have waited through most of 1900 for prices to reach rock bottom before placing business for future delivery. During the months of October and November, more business was placed than during the preceding nine months and the year closed with the majority of the foundrymen closed up for the first half of 1901, although a goodly number are buying for immediate delivery only, still anticipating better prices.

From $23 a ton in January and February, No. 2 foundry iron dropped to $13.50 in October, and in some instances iron was sold as low as $13 per ton delivered Pittsburg. Ac in other products there was a slight weakening in February, and in March and April the prices began to shear off, while the summer months saw reductions of as much as $1 per ton within the period of a few days. The year closed with foundry iron stronger than any of the crude products, the prevailing quotation being $14.50 per ton for No. 2. While southern iron undersold the northern product during the early part of the year, prices dropped so low that it was impossible for the southern furnaces to compete, and during the last four months of the year southern iron was held at from $1 to $2 per ton higher than northern, even after freight concessions were made the southern furnacemen.

**Billets and Sheet Bars.**

With the organization of the American Sheet Steel Co. a number of large buyers of sheet bars and billets were taken out of the open market during the year, and the largest producer as a result found himself with a larger capacity for billets than the market or its own mills required. On the other hand, the steel works of the National Steel Co., an allied interest of the American Sheet Steel Co., added largely to their tonnage, with the result that few large buyers of steel billets, sheet or tin bars are in the market. Billets have had a downward career which was somewhat alarming for a time, as there was no telling where the bottom was located. The records show that it was reached in the months of August and September, while in November better prices were established, which held until the end of the year. The year opened with 4x4 Bessemer billets selling at $35 per ton at Pittsburg, sheet bars at 36, while basic open-hearth billets for immediate delivery sold as high as $43 per ton. Yet in 1899 as high as $55 was paid for high carbon open-hearth steel. The largest producers of billets succeeded in holding up the price of billets to $35 per ton during the first three months, but their efforts during April, May and June failed utterly. While the nominal quotation was $35, sales were made as low as $32 in April, while in May the price dropped to $28 and in June this price was established by the billet manufacturers by agreement. However, the market was beyond all artificial means of holding it in check and before the end of the month small sales were made at $25. As a result of several conferences in July the market was declared open and prices declined to $18 within a few weeks. In August and September as low as $16.50 was done while in October no higher than $17 was paid, except in a few instances. Early in November the steel manufacturers revived their agreement, providing a complete schedule of delivered prices and exacting a money forfeit in cases where the prices are cut. Pittsburg was only taken as the base in deliveries to a few points, while the prices established at other delivered points was somewhat less than the Pittsburg base plus the actual freight tariff added to the Pittsburg base. The price delivered Pittsburg was $19.75 per ton, tin and sheet bars being $1 higher.

**Iron and Steel Bars.**

In finished products probably no line suffered as much as steel bars. So low were the quotations during the summer months that contracts were taken by manufacturers at an actual loss. The year opened with bright prospects, all mills holding to 2.25c. This price was maintained by agreement during the early months, despite repeated rumors that it was being shaded, which later proved to be true. To meet this competition the price was reduced to 2c in April by agreement, but outside interests cut this price and were receiving the bulk of the business. In May bars were selling at 1.75c and in June the agreed price was reduced $5 a ton to meet this figure. However, all efforts to maintain an agreement failed and in June the quotations were $6 per ton lower than during the previous month. The large consumers of bars that were expected to come into the market early in July, decided to wait and before the end of the month business was being placed at 1c. Early in August prices went even lower, one desirable contract having been placed at .87½c, at mill, Pittsburg. However, this was an exception, as the majority of the contracts were placed at 1c and above, rather than below. The amount of business placed during this reign of low prices was enormous and the market strengthened somewhat as a result. During November bars were held at 1.20c to 1.25c and the year closed with 1.25c being quoted by nearly all the large interests but not by agreement. The situation is strong in this line, mills being filled up on large contracts and in many instances unable to make deliveries within a month.

Bar iron and steel bars engaged in a price war during the summer and iron bars came out second. Many consumers of iron bars who had believed they could not use steel bars came to different conclusions when they found that they could contract for the steel product at from $5 to $7 per ton less than for iron. The manufacturers of iron bars were greatly handicapped by the Amalgamated Association scale settlement. Not knowing its outcome for three months, when the bulk of the bar business was placed, much tonnage was lost by them to the steel manufacturers, the largest of whom operated throughout the summer. At the beginning of the year, 2.20c was the ruling quotation, but prices dropped within six months almost $20 per ton. In September and October a considerable tonnage was placed with the mills idle during the summer and nearly all will begin the new year with a comfortable tonnage booked that will keep them in operation at least two months. Refined iron bars dropped from 3c to 1.75c.

The idleness of the bar iron mills greatly affected the output of muck iron for 1900. Prices here also were affected by the downward tendency of the market and from $34 per ton in January prices dropped to $26 in July. The majority of the puddling furnaces were shut down during July, August and September, pending the scale settlement, and during this period prices dropped to $24 per ton. Demand for muck iron was only fair during the latter portion of the year, and the price at the close was $25.50 per ton.

**Plates.**

Plates suffered in price almost as severely as steel bars during the past summer, but recovery was somewhat quicker and the year closed with quotations relatively higher. Although the year opened with tank plate at 2.40c, there was a noticeable weakness, due to the fact that not much business was booked for future delivery. March found quotations at 2.20c, while the scare given the general market in April by certain announcements in Wall Street, caused a drop to less than 2c. The decline in the succeeding months until July was very great and in that month quotations were made at 1.05c. In August the market fared little better and in September and October a large amount of business was placed at exceedingly low prices. In a few instances less than 1c Pittsburg was done. Feeling that the market had reached bottom, shipbuilders began to buy, and once begun the buying movement kept up at such a pace that mills were not only filled up until the end of the year, but the largest producer is booked ahead far into 1901. The heavy demand for steel cars lent additional strength to the market, and in November an agreement of the plate manufacturers was announced, and the price for tank fixed at 1.35c. Then followed a revision of prices at delivered points based on tank plates at 1.40c, Pittsburg.

**Sheets.**

During the early part of last year the sheet mills of the country did not share in the general prosperity of the iron and steel trade. Fierce competition kept prices down, and with the successive failures to combine the sheet mills of the country, there seemed little hope for some of them. The year opened with black sheets No. 28 gauge at 3c. Prices became stronger immediately upon the announcement, after several failures, that the proposed combination would be effected and quotations in April, despite the fact that the iron trade was suffering greatly, were higher than at the first of the year. In the summer prices suffered, dropping as low as 2.80c. During the latter portion of the year a slight reaction set in and sheets for future delivery were sold at 3c. Galvanized sheets enjoyed an excellent demand during the last four months of the year and mills are no longer making the customary freight allowance to consumers.

**Ferro-Manganese.**

From $125 to $62.50 per ton is the record established by ferro-manganese. This product was affected like all other products of the iron and steel trade and the decline, which at a glance would seem enormous is not at all out of proportion to that of other products.

### Structural Material.

The past year has been an exceptionally good one for the manufacturers of all kinds of structural material and, owing to the agreement, prices did not suffer nearly as much as those of other finished products. Beams and channels, 3 to 15 inches, were held at 2.25c at the beginning of the year, prices being ratified by the manufacturers on December 19, 1899, and fairly well held until June. The price was then reduced $7 per ton, while angles were reduced $9 per ton. However, this reduction, while not unexpected, made prospective buyers and consumers hold aloof, with the result that another reduction of $8 per ton, or to 1.50c, was authorized in August. This brought out considerable new business and the buying throughout the fall was more than satisfactory. The building movement that is now apparent through the country has resulted in a good business being placed and the outlook for the spring is considered very good by the trade. The formation of the American Bridge Co. has largely affected this district. The Carnegie Steel Co. as a result of this combination finds an outlet for much of its production of structural material through this source. A number of local bridge builders were included in the consolidation and in the near future Pittsburg will be the seat of one of the largest structural plants in the world.

### Pipes and Tubes.

Tubular goods ruled high in the first two months of the year and during the month of March a slight advance was made on black pipe. April found the trade in no mood to buy, and concessions were being made all along the line the latter part of this month and in May. These continued to be made until June, when a new price list was issued to the trade, which showed a net reduction from the previous list of 20 per cent. Several reductions followed during the summer months, and in September another list was issued, based on the existing prices of raw material. This brought out considerable tonnage and during this month and until the end of the year the amount of business received by the National Tube Co. far exceeded in tonnage that placed during the same months in 1899. The National Tube Co. has been constantly adding to its capacity, while Spang, Chalfant & Co. are also enlarging their plant and increasing their output. Although it is reported that the Carnegie Steel Co. will go into the manufacture of tubular goods, nothing definite has yet been decided. During the year two seamless tube plants in this district were placed in operation. The Atlantic Tube Co. near Beaver Falls, and the Standard Seamless Tube Co., with works at Ellwood City, Pa. Both plants are modern in every way and the last named plant has been absorbed by the National Tube Co., to further increase the combines' output of seamless tubing. In Youngstown, O., an iron pipe mill is projected, the Youngstown Iron, Sheet & Tube Co. having already been organized to build a plant. The Sharon Steel Co., at Sharon, Pa., will also number tubing among its finished lines, but operations will not be commenced before the middle of next year. With the falling off in the demand for tubular goods, there was a proportionate falling off in the demand for skelp during the first six months of the year. Prices also dropped to the low basis established during the summer, although with an excellent foreign as well as domestic demand there was a noticeable recovery in the latter portion of the year.

### Rails.

With sufficient tonnage booked to keep its mill in operation the greater portion of the year, the largest producer looked only upon the brightest side of the rail market at the beginning of last year. The constantly falling pig iron and billet markets, soon assured the rail manufacturers that prices for delivery in 1901 could not be maintained at $35. After one reduction of $32 per ton, for current business, the price of standard section rails for delivery in 1901 was fixed at $26 per ton. An effort was made by the railroads to bring about a reduction of this price, which was considered fair by the rail manufacturers, all things considered. The Pennsylvania Railroad Co., however, promptly placed its order for 140,000 tons, thus materially strengthening the situation. Other roads followed, with the result that more than 1,200,000 tons of rails are on the books of the rail manufacturers for delivery in 1901. One of the most important developments in the manufacture of steel rails was the adoption at the Edgar Thompson plant of the Carnegie Steel Co., of the Morrison-Kennedy method of cooling rails before giving them their final pass. It was found by microscopic examination that the rail is greatly improved by the addition of this cooling table and there is little doubt that it will be adopted by other rail mills. With the impetus given to the bituminous coal mining industry, owing to a large foreign demand, it has been found that the light rail output of the country is not equal to the demand. The lightest section rails sold during December at $30 per ton. A number of mills closed the year unable to make deliveries on light rails within a month to six weeks.

### Old Metal.

Old material was affected the same as new material by the sharp changes of the year, and old iron rails that sold for $32 per ton early in the year went begging in the summer months at $14. Their recovery, however, was wonderful, as the year closed with iron rails selling at $21 per ton, and with an immense demand. During the year the Carnegie Steel Co. developed a market for open-hearth scrap in England and with the addition of open-hearth capacity in this district the demand for old material for the next year will be greater than ever before.

### Coke.

Contracts for the first half of the year for furnace coke were nearly all closed at $3 per ton. In March, furnace coke for immediate delivery sold at $4.25 per ton and in a number of instances as high as $4.75 was paid. Foundry coke also commenced the year most auspiciously and in March prompt shipment coke sold at $4.25. With the shutting down of furnaces and foundries demand for coke fell off considerably until the proyduction of the Connellsville region had dropped off 60,000 tons a week compared with the previous December. During the first week in July several thousand ovens were banked, and prices of furnace coke had dropped to $1.75 to $2 per ton, while foundry coke was commanding $2.25. Neither did the year end very strong. Contracts for the first half of 1901 were closed at $1.75 for strictly Connellsville coke, while outside interests closed contracts at $1.65 and even as low as $1.55. Producers outside of the Connellsville region closed at $1.40 for the nrst half of the year and foundry coke closed proportionately low. During the year, the number of interests producing coke outside of the Connellsville region was greatly increaed. Nearly all of the large iron and steel combinations also entered the coke regions during the year, erecting their own ovens and expecting to depend on them eventually for their coke supply.

AVERAGE MONTHLY PRICES OF IRON AND STEEL AT PITTSBURG, 1900.

| | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bessemer Pig Iron | $25.25 | 24.90 | 24.90 | 24.90 | no'l 24.90 | 20.00 | 17 00 | 15 50 | 13.75 | 1 .25 | 13.75 | 13.50 |
| Gray Forge Iron | $21.50 | 21.00 | 21.00 | 20.25 | 18.00 | 16.75 | 14.65 | 13.50 | 13.00 | 12.50 | 13.28 | 13.40 |
| No. 2 Fdy Ir'n Northern | $23.00 | 23.00 | 22.50 | 22.25 | 19.50 | 17.50 | 15.50 | 14.00 | 14.00 | 13.50 | 14.50 | 14 50 |
| Bessemer Billets, 4x4" | $35 00 | 35.00 | 35.00 | 32 00 | 28.00 | 25 00 | 18.00 | 17.00 | 16.50 | 17.00 | 19.75 | 19.75 |
| Steel Bars | 2.25c | 2.25 | 2 25 | 2 | 1 75 | 1.45 | 1 | 1 | 1.15 | 1.15 | 1.25 | 1.25 |
| Muck Bar | $34.00 | 33 00 | 32.50 | 31.00 | 30.00 | 27 50 | 26 00 | 24.00 | 26.00 | 24.50 | 25.50 | 25 50 |
| Tank Plate | 2.40c | 2.20 | 2 | 1.80 | 1.60 | 1.35 | 1.05 | 1 10 | 1.05 | 1.05 | 1.35 | 1.40 |
| Sheets No. 28 | 3c | 3.10 | 3.20 | 3.30 | 3.20 | 3.05 | 3 | 2.80 | 2 90 | 2 80 | 2.90 | 3 |
| Ferro-Manganese | $ 125 | 125 | 125 | 125 | 100 | 90.00 | 85.00 | 85 00 | 75.00 | 75.00 | 65 00 | 62.50 |
| Furn'ce Coke, at ovens | $ 3.00 | 3 50 | 4 00 | 3.75 | 3.00 | 2.50 | 2.00 | 1.75 | 1.75 | 1.75 | 1.75 | 1.75 |
| Fdy Coke at ovens | $ 3.25 | 3 75 | 4.25 | 4 00 | 3 25 | 2 75 | 2.25 | 2.25 | 2.25 | 2.25 | 2.25 | 2.15 |

A .O. B.

The Cleveland Axle Mfg. Co., Canton, O., has made improvements in its plant in the past few months. Shipments have been made or are about to be made to South Africa, South America, Australia, and Paris, France.

The American Bridge Co. has a contract to furnish to the Compagnie des Chemins de Fer de Porto Rico two 133-ft. spans for the Manati River Bridge, Porto Rico.

It is reported that there will be a complete change of control in the management of the Lebanon Boiler & Foundry Co., of Lebanon, Pa., in January. Philadelphia capitalists have secured the controlling interest.

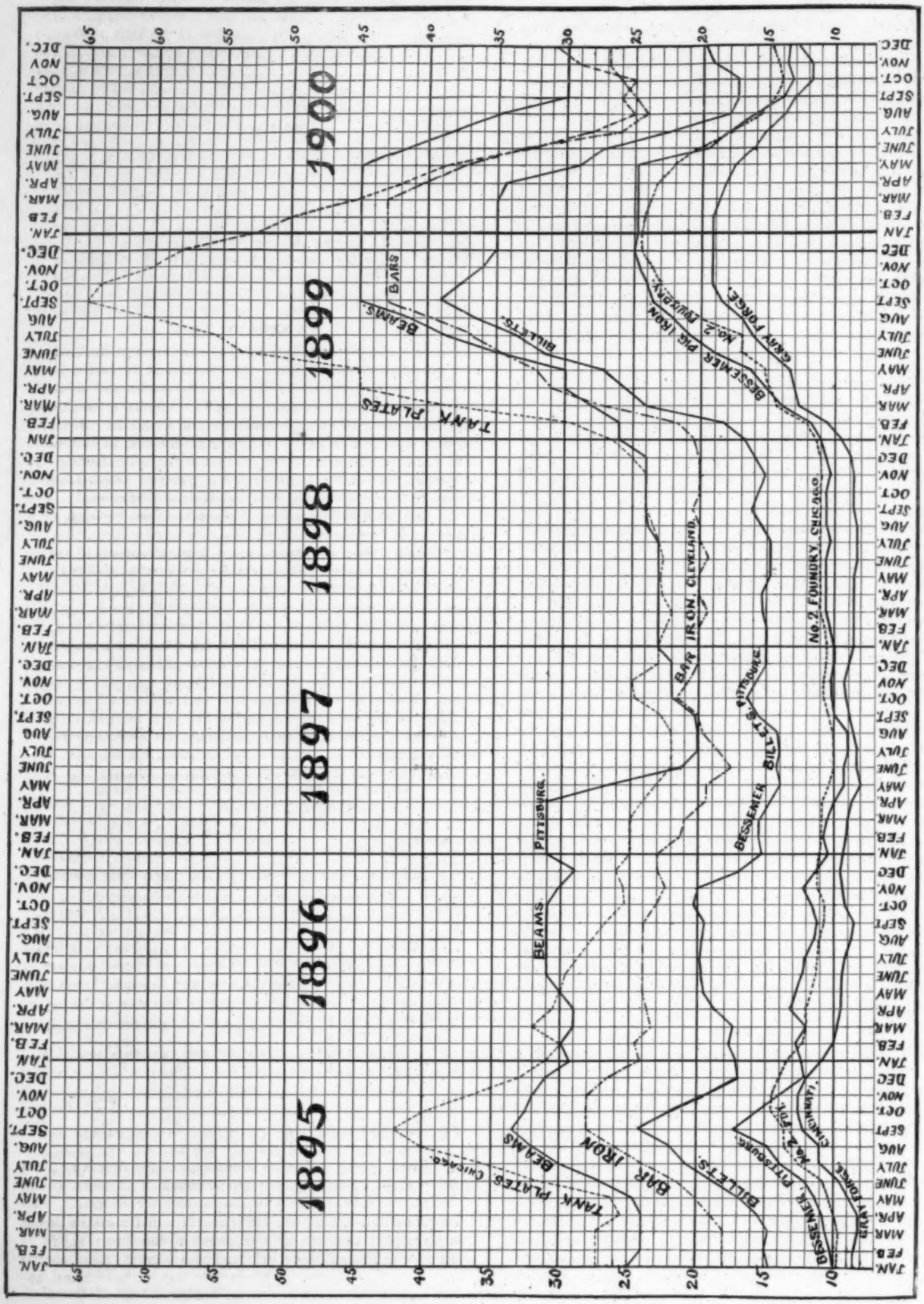



**DIAGRAM OF PRICE FLUCTUATIONS IN IRON AND STEEL IN 1895, 1896, 1897, 1898, 1899 AND 1900.**

*(Prices in dollars per gross ton of Pig Iron and Billets; per net ton of Plates, Beams and Bar Iron.)*

## THE IRON MARKET IN 1900.

The year 1900 opened with some iron and steel products at the highest point to which the excited advances of 1899 carried them, others slightly below the extreme prices paid on prompt delivery sales, and yet others, maintained by means of agreements or of almost complete control by a single large company, on a level that took little account of supply and demand. There were few in the trade who on looking back upon the suprises of 1899, had the courage to make predictions. Buyers, noting that the climax of the boom had been reached in November, and that production had overtaken demand, began the waiting policy that dragged on for months into 1900; yet at that time sellers were full of confidence, some even predicting that the first buying movement of the new year, after a lull in which the strength of the situation would be displayed, would carry prices even higher.

Many had not shared greatly in the good things of 1899 because they had sold well into that year at the low prices preceding the advance. As compensation they had taken on business at figures near the top, with deliveries running through most of the first half of 1900 and hoped to fill out the year with orders at something near the same basis. No thought was given as the year opened to the great crop of readjustments which it was to produce; and those who had already counted the profits on business booked for the first six months found to their dismay, when the time was scarcely more than half up, that on a rapidly declining market sales too often have only the force of options.

January passed and then February without the appearance of the new buying which had been awaited since October. March followed with a similar record of abstention from the market. The confidence of buyers that a lower level would be established grew stronger. There was a general feeling, indeed, that the trade must come to lower prices before business could be done freely. Yet large interests maintained that with so many contracts in existence based on boom prices much loss and demoralization would follow, if any considerable reductions were made. It was argued also with some reason, that to cut prices would not increase business but lead to a longer wait, since no assurance could be given that any new price that might be fixed would not soon give way to a lower one. More influential than any other considerations, however, was the fact that all producers had several months business on their books representing large profits, and were disposed to let the future develop itself.

But April brought events that cut the knot. The sudden closing down of a dozen wire mills, the reduction of 1c a pound in wire and nails, the Wall Street crash in steel stocks, are familiar history. The desperate struggle in the building trades at Chicago had cut down the nail trade, and high prices had greatly reduced the agricultural demand for wire; and stocks had accumulated until there was no other recourse but a cessation of production. The iron trade was still prosperous but this startling object lesson in the effect of high prices exerted widespread influence; and from the middle of April until the end of July there was a halting irregular market, with no stimulus to buying on a liberal scale until the sensational cuts in steel bars to the agricultural trade took prices below the cost line. Then consumers took hold liberally and from those mid-summer contracts is dated the gradual return to the healthful conditions that prevail throughout the market today.

More detailed narratives of the year's market developments, together with comment on the more permanent movements in the trade in 1900 appear in other columns. The year's record has been a peculiar one. The iron trade, hampered by too high prices, bound by agreements in one quarter and another, has been stumbling and plunging down, unable to move freely. Some of the bands have been broken and the movements of today are more natural. The operations of the consolidations have not been, as a whole, such that they could be made the basis of a generalization as to the effect of aggregations upon the trade at large. In the main the great companies have maintained amicable relations. It remains to be seen whether under the test of enlarging capacity in various lines this condition can be maintained.

The production of pig iron for the year will probably prove to be close to 13,750,000 tons; for 1899 the official figures were 13,620,703 tons. In the first half of 1900 the production as officially ascertained was 7,642,569 tons, far the greatest six months' output ever known. In the past year the blast furnaces record has shown a great change. The high point was reached in February, when with 296 furnaces active the weekly output was 298,014 tons. The number of active furnaces was at a minimum on Nov. 1, when 201, with a weekly output of 215,304 tons, were in blast, or 95 less than at the high point.

The shipments of Lake Superior ores by water and all rail were about 18,500,000 tons, as against 18,251,804 tons in 1899. It is probable that the ore production for the entire country will prove to have been between 25,000,000 and 26,000,000 tons. Coal production was considerably beyond 250,000,000 gross tons, for the second time exceeding that of Great Britain. The export trade in coal was a larger factor than before and promises to increase greatly in the coming year. The Connellsville coke output is estimated to have been beyond 10,000,000 tons, or the greatest in the history of the region. For the first half of the year it was 5,746,252 tons. Prices for ore and coke were the highest in years, old range Bessemer ores from Lake Superior bringing $5.50 for the base ore, against $2.95 in 1899. Connellsville furnace coke went up to $3 on contract, and $3.50 was paid in many cases on prompt shipments.

### Prices of the Year.

On page 18 we give a graphic representation of fluctuations in the prices of leading products in 1900, and in the five years preceding. The vertical lines represent months and the horizontal lines prices per ton in dollars. The traversing lines indicate the changes in monthly averages, and do not necessarily show the lowest or highest price touched in any week. For 1900 this is shown in the second of the tables below. The diagram on page 18 shows how the boom of 1895 compares with that of 1899; also how prices fell away after each. The table of monthly averages from which the lines for 1900 were plotted is as follows:

AVERAGE MONTHLY PRICES OF IRON AND STEEL PRODUCTS IN 1900.
[Pig iron and billets, gross tons; finished material, net tons.]

| | Jan. | Feb. | Mar. | Apr. | May. | June | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No. 2 Fdy., Chicago | 24.50 | 24.25 | 23.75 | 23.25 | 22.00 | 20.25 | 17.75 | 15.50 | 14.50 | 14.00 | 14.25 | 14.60 |
| Gray Forge, Cincinnati | 19.25 | 19.25 | 18 75 | 18.40 | 17.75 | 16.25 | 15.25 | 12.90 | 12.00 | 11.75 | 11.75 | 12.75 |
| Plates, Chicago | 52.50 | 50.00 | 45.25 | 42.00 | 38.75 | 32.75 | 28.00 | 25.00 | 26.00 | 25.00 | 29.25 | 30.75 |
| Billets, Pittsburg | 35.00 | 35.00 | 35.00 | 34.50 | 29.00 | 27.25 | 22.50 | 18.00 | 17.50 | 17.50 | 19.30 | 19.75 |
| Bessemer Pig, Pittsburg | 21.90 | 24.90 | 21.90 | 24.90 | 24.90 | 19.75 | 18.00 | 16.05 | 14.00 | 13.25 | 13.65 | 13.55 |
| Beams, Pittsburg | 45.00 | 45.00 | 45.00 | 45.00 | 45.00 | 41.50 | 38.00 | 34.80 | 30.00 | 30.00 | 30.00 | 30.00 |
| Bar Iron, Cleveland | 43.00 | 1.00 | 43.00 | 40.50 | 37.25 | 31.00 | 26.00 | 24.00 | 25.00 | 26.00 | 26.75 | 26 75 |

In the table below the prices of the products at the beginning and end of the year are given, and for the lowest and highest weeks of the year. In all products except sheets, which were 2.90c Pittsburg on Jan. 1, and 3c Dec.31, the opening price was the highest of the year. Steel rails, which are not in the table, opened the year 1899 at $18 and advanced until $35 was reached, this being the basis on which contracts for 1900 were made. This price held through the past year until September, when $26 was established and has been maintained. Steel bars opened the year at 2.25c Pittsburg, reached the lowest point at .90c in August and are now 1.25c. Tin plates were $4.65 a box at mill for 100-lb. cokes at the beginning of the year; in September the price was reduced to $4:

| | Jan. 1, 1900. | Lowest Week, 1900. | Highest Week, 1900. | Jan. 1, 1901. |
|---|---|---|---|---|
| Local No. 2 Fdy. Iron, Chicago | $24.50 | $13.75 | $24.50 | $14.75 |
| Gray Forge, Cincinnati | 19.50 | 11.50 | 19.50 | 12.75 |
| Tank Plate, Chicago, net ton | 50.00 | 24.00 | 56.00 | 31.00 |
| Billets, Pittsburg | 35.00 | 16 50 | 35.00 | 19.75 |
| Beams, Pittsburg, net ton | 45.00 | 30.00 | 45.00 | 30.00 |
| Bessemer Pig, Pittsburg | 24.90 | 13 00 | 24.90 | 13.50 |
| Bar Iron, Cleveland, net ton | 43.00 | 24.00 | 43 00 | 27.00 |

Under the title, "Electrical Conductors," the American Steel & Wire Co., issues a pocket size pamphlet of 32 pages, giving details of its electrical wires and cables for telegraph, telephone and light and power circuits. It is not a catalogue but a promise of one that will be issued in due time. Tables of sizes, weights, and other information are given, all of special value to those having to do in any way with electrical appliances. It will be mailed on application.

It is probable that the Vance Boiler Works, at Geneva, N. Y., will shortly be removed to Oswego, N. Y.

# INDUSTRIAL SUMMARY.

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

**New Buyers in the Market and Some of Their Wants:**

It is reported that a four-mill sheet plant will be erected at Atlanta, Ind. Dr. H. E. Utz, of that place was in Pittsburg last week securing prices on the erection of such a plant.

W. P. Russell of Spokane, and D. C. Gearnsey of Dayton, Wash., are organizing the Northwest Anchor Fence & Mfg. Co., for the manufacture of wire fencing. Plants will be located at Spokane and Dayton, Wash.

The Van Winkle Hardware & Improvement Co., of Roff, Tex., has been incorporated with capital of $10,000.

A corporation to be known as the Brown-Corliss Engine Co., is being organized at Milwaukee, Wis., with a capital of $1,000,000. Engines ranging from 100 to 5,000 h. p. will be produced. The plant is to cost not less than $300,000. T. W. Phillips of Providence, R. I., will probably be elected president.

The Union Wire Mill Co., of East St. Louis, Mo., has been incorporated with a capital of $10,000, for general wire manufacture. H. A. Kreibohn, C. F. Hintze and H. J. Eggman are the incorporators.

The Wheland Machine Works of Chattanooga, Tenn., have been incorporated with a capital of $100,000, and take over the business operated by the Wheland Foundry & Machine Works. New and improved machinery will be added to the plant. G. W. Wheland, Z. W. Wheland, E. I. Wheland, R. I. Calloway and ... W. Nagel are the incorporators.

The bids to be received until Jan. 10 for the Dallas, Tex., waterworks will include estimates on about 1,200 tons of cast iron pipe (mostly 16 and 24-inch diameter), and special castings, supplying gate valves and fire hydrants, and laying water pipe and settling valves and hydrants.

The Cherokee Iron Works, Gaffney, S. C., has been incorporated, with capital stock of $30,000, by John L. Black, W. L. Davies and W. A. Sarratt.

John L. Grafflin, Wilmington, N. C., has invented a machine for cutting keyseats on shafts, and will have it manufactured.

The Kansas City File Works Co., Kansas City, Mo., has been incorporated for the manufacture of files, rasps, etc.; capital stock is $5,000.

A. D. Reynolds, Bristol, Tenn., is interested in the organization of a company to build a foundry.

The R. W. Whitehurst Co., Portsmouth, Va., has been incorporated, with capital stock of $100,000, for the manufacture of agricultural implements, by R. W. Whitehurst, president; John B. Sanford, vice president, and E. K. Bonney, secretary.

The Carey Machinery & Supply Co., Baltimore, Md., has been incorporated to take over the machinery and supply business of Thomas K. Carey & Bros. Thomas K. Carey is president; James Carey, Jr., treasurer; Robert O. Coulter, secretary, and A. Morris Carey, general manager; capital, $60,000.

---

**Fires and Accidents:—**

The Sodom shops of the B. & O. railroad at Connellsville, Pa., were destroyed by fire last week with a loss of $40,000.

The machine shop operated by Zook & Hartzler at Belleville, Pa., was destroyed by fire last week entailing a loss of $7,000.

The cooperage plant of the American Steel & Wire Co., at Rankin, Pa., was destroyed by fire last week. The loss is estimated at $25,000. A more extensive plant will be immediately erected.

The Joliet, Ill., plant of the Pressed Steel Car Co., was damaged to the extent of $100,000 by fire last week. It is probable that the plant will be rebuilt.

The Vulcan Iron Works at Hamilton, O., sustained a loss of $2,000 by fire last week.

---

**New Construction:—**

The Steel-Tired-Wheel Co., of Chicago, Ill., manufacturers of car wheels, will erect a $25,000 plant at Denver, Col.

The new sheet mill company formed recently by Canton, O., capitalists will erect its plant just west of the city limits of Canton. The land was purchased by W. J. Stule, one of those interested, who was formerly secretary of the Canton Roll & Machine Co. The main building will be a steel structure, 300 x 130 feet. A six mill plant will be built, and will cost about $250,000.

Pattin Bros. & Co., Marietta, O., have just completed a new brick foundry and pattern shop for the production of gray iron and brass castings of every description. The molding room is 50 x 120 ft. with a traveling crane the entire length. The cupolo room is 16 x 32 ft. and the pattern shop 26 x 38 ft. The entire equipment is modern and up to date.

The new foundry and erecting shops which are under construction for C. Hanika & Sons' Architectual Iron Works at Celina, O., are nearing completion. When they are ready, part of the plant now at Muncie, Ind., will be moved to the new plant, which will give the company 30,000 square feet of floor space. They are ready now to receive bids on machinery and electrical supplies, and when fully equipped will have one of the most modern plants in their line.

The Maryland Tin Plate Co., of Cumberland, Md., has commenced the erection of an additional black plate plant for the use of N. & G. Taylor Co., of Philadelphia, lessees. The building will be of steel construction, 75 x 154 feet. The entire production of black plates will be shipped to the plant of N. & G. Taylor Co.'s tin plate works at Philadelphia, where it will be finished and tinned.

The Warren City Boiler Works Co., Warren, O., will immediately erect an addition 115 x 150 feet in size.

Contracts for the construction of the steel car plant of the Southern Car & Foundry Co., to be erected at Birmingham, Ala., have been let and signed. The Tennessee Coal & Iron Co., donated seventy-five acres of land as a site for the plant, and agrees to furnish the car plant with steel, iron, coal and coke for its operation, based on ruling market prices. The plant will have a daily capacity of ten steel and ten wood cars.

It is reported that the Laughlin Nail Co., of Martin's Ferry, O., will build a four-mill sheet plant in the near future.

The Woodruff-Edwards Foundry Co., of Elgin, Ill., will erect an addition to its present plant, 70 x 30 feet in size.

---

**The Pittsburg District:—**

The Pressed Steel Car Co., received an order last week from the Philadelphia & Reading railroad for the construction of 1,000 pressed steel cars. The Cambria Steel Co., of Johnstown, Pa., received a contract for 500 steel cars.

The Carnegie Steel Co. has recently purchased about 700 acres of land along the Allegheny Valley railroad, at a distance of twenty-three miles from Pittsburg and extending along the Allegheny river for a distance of about two miles. The tract is well adapted for manufacturing purposes and in addition is underlaid with a thick vein of coal. No immediate use will be made of the property.

The bridge and structural iron workers of the Pittsburg district have asked for an increase in their wages from 27 to 33 1-3 cents an hour. The demands were made on Oct. 1, but as yet none of the manufacturers have acceded to their demands. Unless the demands are granted this week a strike will be declared.

The Carnegie Steel Co., has been awarded a contract for 6,000 tons of steel rails by the Great Eastern railway of England.

On January 15 a charter will be applied for, for the incorporation of the Allegheny Roll & Machine Co., at a nominal capital which will later be increased to $100,000. The new concern will be closely allied to the Allegheny Iron & Steel Co., which is erecting a four mill sheet plant. The output will consist of rolling mill machinery and steel castings.

The J. V. Rose & Sons Fire Brick Co., Sharon, Pa., have decided to erect a plant for the manufacture of building and foundation brick with a daily capacity of 50,000.

The blast furnace which the American Steel & Wire Co., has under construction on Neville Island, will not be blown in for three months owing to delays in securing material.

Bids were opened at Pittsburg last week for the furnishing of several miles of cast iron and riveted steel water mains for the city. The bid of Booth & Flinn for cast iron pipe was $698,500, and steel pipe $676,500. T. A. Gillespie bid $706,500 for furnishing the cast iron pipe and $669,000 for the steel pipe. Keeling & Ridge bid $731,200 for the cast iron pipe and $718,500 for the steel pipe. Contracts have not yet been awarded.

The structural steel work required in the erection of a new

14 inch continuous mill at the Duquesne plant of the Carnegie Steel Co., will be furnished by the American Bridge Co.

All departments of the National Tube Co., at McKeesport, Pa., resumed operations this week after being shut down since Christmas. Repairs and improvements have been made.

Isabella Furnace No. 1, of the American Steel Hoop Co., at Etna, is making a record for operation on lining, and provided there is no breakdown within the next few months the present lining will have continued in service for a period of seven years. This will be a record never yet approached. The furnace was erected in 1872 and despite the fact that it lacks many of the improvements of modern furnaces, it can produce from 250 to 300 tons of iron daily. As soon as Furnace No. 3 of this group is completed, No. 1 will be shut down and completely rebuilt. The stack will be 90 feet high and it will have a 23 foot bosh.

Jones & Laughlns, Ltd., have about completed the changes in their bar mill, and the installation of reels and other equipment, by which they will be able to furnish wire rods to the trade. They expect to be in the market with rods early this month. The company's third new Eliza Furnace is about completed, and will be started early in January. The fourth stack, now under erection, will not be completed before April or May, or perhaps later. These furnaces are among the largest ever built, are up to date, and are expected to turn out daily 600 tons or more each.

The Crucible Steel Co., of America, will erect a new open-hearth steel plant near Pittsburg, to consist of twelve 50-ton furnaces. A blooming mill and a continuous mill for small sizes of billets will also be built.

Ground will soon be broken for the erection of the new plant at Neville Island, for the American Iron & Steel Mfg. Co., of Lebanon, Pa.

The Pittsburg office of Rogers, Brown & Warner, dealers in pig iron and coke, has been removed from the Westinghouse building to rooms 1008 and 1009 Park Building. Howard M. Hooker is manager.

It is stated that providing the Standard Underground Cable Co., of Pittsburg, can secure the laying of the projected Pacific cable an additional plant will be erected in the Pittsburg district.

The blast furnace of the National Steel Co., at Sharon, Pa., resumed operations last week. The wages of the men employed in the plant will be reduced 10 per cent the ensuing year, the scale being the same as the one paid in 1899.

---

**General Industrial Notes:—**

Charles H. Besly & Co., 10 and 12 North Canal St., Chicago, report numerous inquiries for their catalogue, together with requests for estimates on tools and material, indicating increased business for 1901. Recent orders for complete equipments of small tools and supplies have been received from Ohio, Indiana, Iowa, Texas, Kansas, Nebraska, Montana and Utah. Many letters are received from foreign countries asking for circular matter and full particulars of this company's specialties, and recent shipments have been made to Buenos Ayres, Montevideo, Brazil and England. Many orders are being received for Gardner grinders, the feature of which is the spiral grooved disc. Shipments have recently been made to Ohio, Connecticut, Pennsylvania, New York and Massachusetts. At the company's factory at Beloit, Wis., the addition of new and special machinery has increased the output five-fold. A new 300-page illustrated catalogue will be mailed to any address upon application.

The new foundry erected by the Cedar Rapids Pump Co., at Cedar Rapids, Mich., will be placed in operation in March.

E. C. Darley, The Rookery, Chicago, agent for the Cahall Sales Department, reports contracts closed with the Sloss-Sheffield Steel & Iron Co., Birmingham, Ala., for two 500 h. p. Cahall boilers, and with the Glucose Sugar Refining Co., Chicago, for six 2,500 h. p. Cahall boilers, with chain grates and stacks.

The Cleveland Punch & Shear Works Co., of Cleveland, has nearly completed its new erecting shop, which has been in process of construction for some time, and soon after the first of the year the company expects to be in shape to make better deliveries on tools in its line. The new shop will have a complete electrical equipment, including electric traveling crane, and will be a modern shop in every respect. Recent shipments of tools have been made as follows: 25-ft. plate planer to the National Tube Co., McKeesport, Pa.; two 19-in. throat punches to S. B. Rheam & Co., Pittsburg; one special "I" beam punch with 21-inch throat to the Brown-Ketcham Iron Works, Indianapolis, Ind.; one 44-in. throat punch on the order of the Pratt & Whitney Co. of New York; one 30-in. throat punch, one 10-in. throat punch, and one 12-ft. radial drill to the Browning Engineering Co. of Collinwood, O.; one bending and straightening machine to the Meehan Boiler & Construction Co., Lowellville, O.; one 50-in. rotary planer with 12-ft. bed, and a 15-ft radial drill to the Hay Foundry & Iron Works, Newark, N. J.; one No. 5 bar shear, capacity to cut 4x4 billets cold, to the J. B. Carr Co., Troy, N. Y. Inquiries are coming in very satisfactorily, with indications of a prosperous year.

The puddlers at the Lebanon Rolling Mill, Lebanon, Pa., struck on being refused an increase in pay from $3 to $3.50 per ton.

The Crane Co., of Chicago, made a Christmas distribution to its employes, each receiving an amount equal to 5 per cent of his yearly earnings.

The Aultman Co., of Canton, O., recently shipped two oil engines to Africa. A large charging machine weighing 40 tons was recently shipped to Melrose Park, Ill.

Citizens of Portsmouth, O., recently met to discuss ways and means of compensating the city for the loss of the Burgess Iron & Steel Co., which was recently shut down by the Crucible Steel Co., of America. As a start, $100,000 was guaranteed and merchants and manufacturers offered to subscribe $50,000 additional to erect a steel plant.

The Republic Iron & Steel Co. is planning for the erection of a 26 inch bar mill at its Brown-Brownell plant at Youngstown, O.

At the annual meeting of Fraser & Chalmers, Ltd., held in London recently, it was reported that the war in the Transvaal had interfered seriously with business during the last year. It was voted to increase the capital stock $351,000, or from $1,842,750 to $2,193,750, by the creation of 24,000 new ordinary shares of £3 each. The chairman said that £6,000 of goods had been requisitioned by the Transvaal government, of which £4,500 was insured. The maximum loss, he said, would be £6,000. He estimated, however, that the profit in the Johannesburg trading account would cover the loss.

The sheet mill of the McCullough Iron Co., at North East, Del., resumed operations last week after a shutdown of several months.

The Baldwin Locomotive Works of Philadelphia, Pa., have received a contract for the erection of 45 locomotives for the Philadelphia & Reading railroad. During the past year this company has exported 363 locomotives of the 1217 built. In 1899, 501 locomotives were built, of which 338 were for export.

The directors of the Youngstown Iron, Sheet & Tube Co., of Youngstown, O., recently organized, have issued a circular letter to their stockholders denying that any movement was on foot for the absorption of the company by any of the iron and steel consolidations.

The Elkhart Iron Works at Elkhart, Ind., have been sold to the South Bend Plow Co., of South Bend, Ind., who will remove the machinery to South Bend.

John D. Shields and Horace G. Cooke, have purchased a controlling interest in the plant of the Paterson Iron & Steel Forge Co., at Paterson, N. J.

The Youngstown Iron & Steel Roofing Co., of Youngstown, O., has booked an order for 40,000 yards of expansion metal lath.

The first heat was poured in the new plant of the American Foundry Co., at Rockford, Ill., last week. The building containing the foundry is 275 x 80 feet and contains a cupola room 60 x 35, core room 30 x 40, machine room 60 x 40, pattern room 60 x 40, and storage vault, 32 x 20. The output will consist of light grey castings. G. D. Roper, S. S. Brumbaugh and C. H. Hopke are the operators of the plant.

The Chicago office of the Trenton Iron Co., 114 Monadnock Building, sends to the trade a vest pocket ready reminder, which contains wire rope price lists, in addition to the usual information.

## MACHINE MOLDED M. C. B. DRAW BARS.

BY H. WHITING.

Perhaps no single fact more strongly indicates the rapid advancement in all lines of manufacture at the end of the old and the beginning of the new century than the unprecedented substitution of machine for hand labor. The latter is slow, inaccurate and subject to imperfections and variations due to the "personal equation" and threfore expensive; the former rapid, true in every line and reduces cost to a minimum. Nowhere are these facts better exemplified than in the manufacture of the "Chicago" and "Munton" automatic couplers at the Melrose Park, Ill., works of the Latrobe Steel & Coupler Co. This company and its predecessor have been manufacturers of car couplers practically since the present style of drawbar was adopted by the Master Car Builders' Association and until the last year had experimented with various methods of molding, casting and foundry practice,

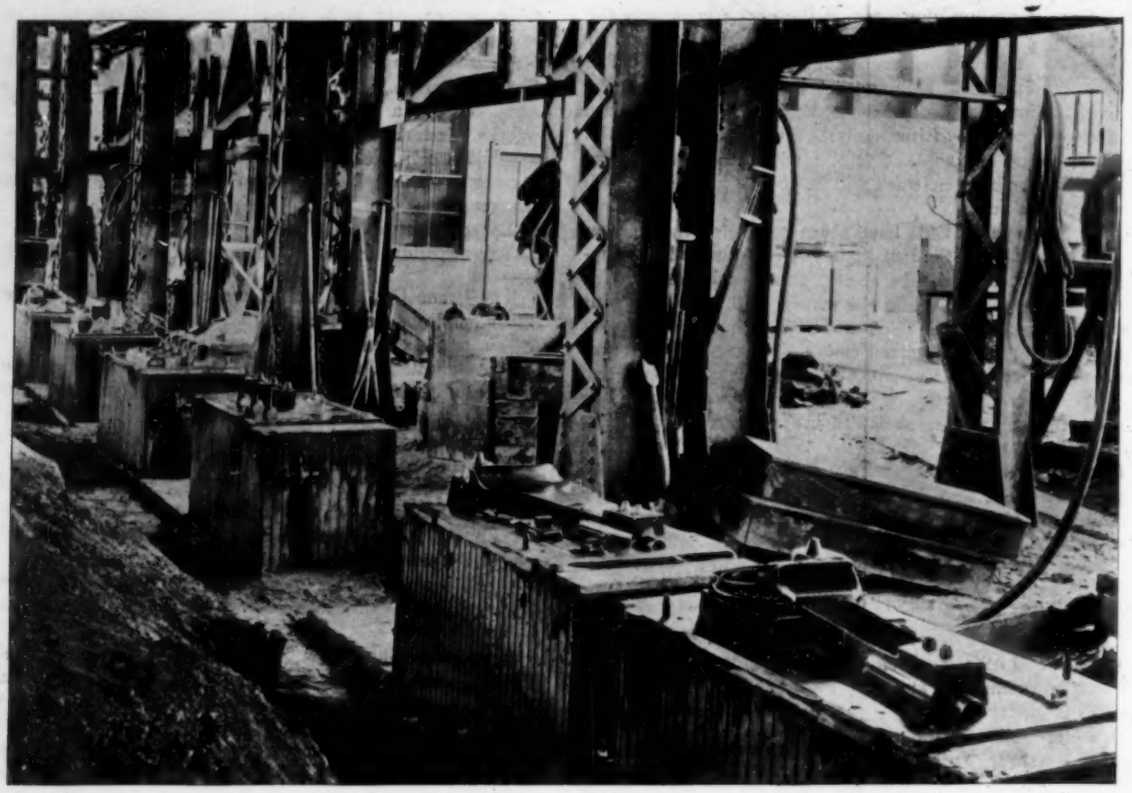


FIG. 1.—MAYWOOD MOLDING MACHINES IN LATROBE STEEL & COUPLER CO.'S FOUNDRY AT MELROSE PARK, ILL.

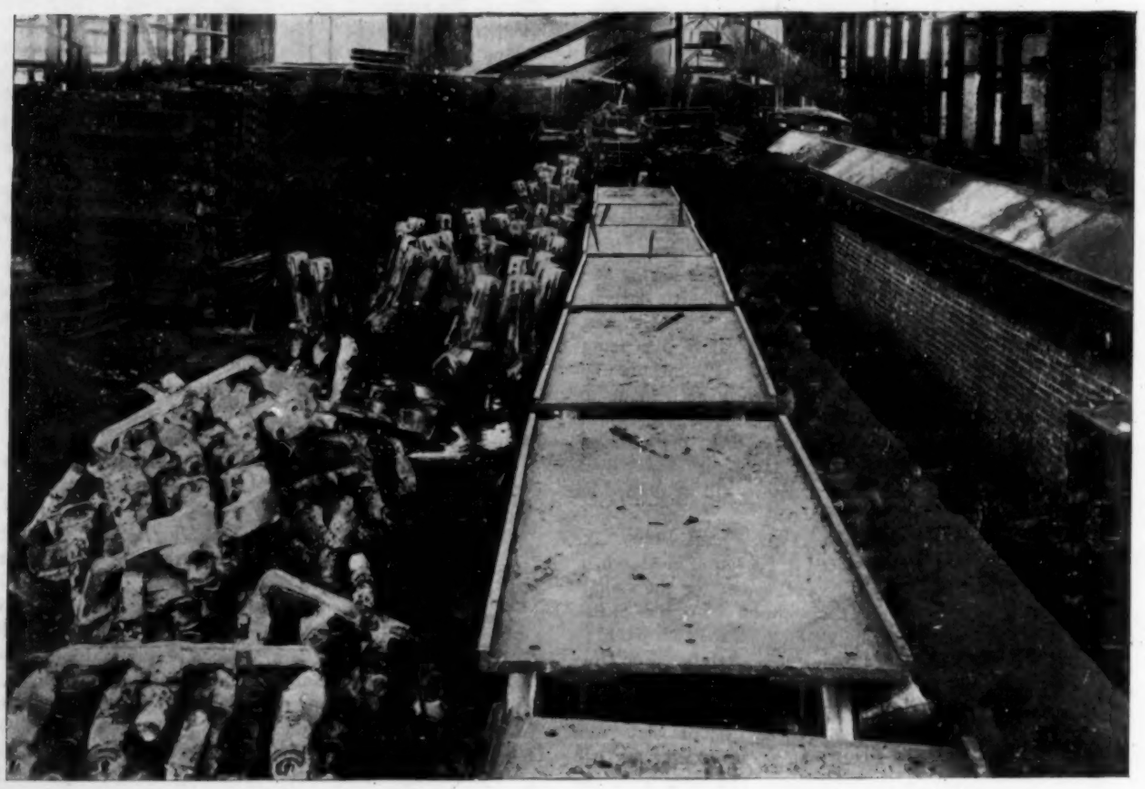


FIG. 2.—CASTING ROOM OF LATROBE STEEL & COUPLER CO, SHOWING MOLDS AND POURING PIT.

including hand molding and chills. It has now equipped the entire plant with molding machines of the strippng plate type designed and manufactured by the Maywood Foundry & Machine Co. of Maywood, Ill., some of which is illustrated herewith. They have already installed five sets of these machines, each set consisting of one cope and one drag machine and have placed orders for several additional machines.

The machines are simple in construction, consisting of rigid vertical guides upon which the plate holding the patterns is advanced and drawn. Air is used to draw the patterns and replace them on the stripping plate, two cylinders and pitmans actuating cranks being attached to each machine. The patterns when in position are rigidly held there by throwing the crank just past the upper center against a stop. Thus when the patterns are drawn they fall vertically directly away from the molds and, as is the case with some molding machines, do not tend to break or loosen the sand by raising above their normal position to unlatch. There does not appear to be any part of the mechanism which will suffer through contact with the sand. In fact, everything below the

FIG. 3.—CASTING JUST AS SHAKEN OUT. MADE ON THE MAYWOOD MACHINE.

stripping plate is enclosed with the exception of the foot lever of the valve which admits air to the cylinders.

Each set of machines is served by an air pillar crane of 2,000 pounds' capacity, which handles the flasks to and from the machines. Instead of the customary channel bar flasks heavy cast iron flasks are used, as it has been demonstrated that in hammering the molds when shaken out men will knock channel iron flasks out of shape with sledges, channel iron bending under the heavy blows. The flasks have a very small flange at both top and bottom on the inside for the purpose of giving a little purchase to the sand and retaining it without bars. After cleaning out the flasks are stacked by one of three overhead electric traveling cranes on the circumference of the semi-circle served by the air jib crane mentioned above, which is located a few feet from and on the line between a cope and drag machine. The machines are all on the same line at the north side of the building with core ovens in an adjoining building north, and opposite the machines on the south side of building are the open-hearth reverberatory furnaces. To each set of two machines there are two rammers, one boy on machines and one core setter. For the purpose of this comparison we disregard all crane hands as they do the work previously done by helpers and floor laborers.

The process of handling the flasks and molds is as follows: The boy in each gang attaches air crane hooks to the trunnions of the flask and steadies it to its proper position on the stripping plate to which it is guided by pins which pass through drilled holes in the outer flanges of the flask. The boy then rapidly brushes the iron patterns and plate with oil, sprinkles them with dry sand and discharges the proper amount of facing sand into the flasks and about the patterns from an overhead hopper and chute. This application is followed by another of floor sand also from overhead chute, after which the mold is rammed. At present the practice is for the two hand rammers to work on either cope or drag at the same time, but with the introduction of the Maywood air rammer, which is reversible, mounted on trunnions and which will be equipped with butt and pein on either end, it is calculated that one of these hands may be dispensed with, as the rammer will do the work of several hand rammers, striking as it does from 250 to 400 blows per minute.

After the mold is rammed the boy strikes off the surplus sand, the patterns are drawn in an instant by foot pressure upon the lever of the air valve and the perfect and finished drag is lifted from the stripping plate by the air crane and placed in position on the floor by the boy with the assistance of one core setter who places the core and guides the cope into place. Molds are gated together, five knuckle molds and four drawbar molds being stacked upon each other and clamped together and thereafter handled as a unit or single mold by the electric cranes. The practice is to alternate the two rammers working first on the cope and then on the drag machine, the boy helper, core maker and crane man being able in this way to keep them supplied with work. The working semi-circumference of the air crane will accommodate about 12 units or stacks of molds and as fast as one is completed it is transferred by the electric crane to the pouring pit. After pouring, the molds are lifted upon a grate between the pouring pit and furnaces and shaken out. The castings are then transferred to the chipping and cleaning department by rail, cars running on a track between the grating and furnaces. The flasks are cleaned on the grating and retransferred by traveling cranes to their positions on the floor. The sand falls through the grating and is carried by a reverberatory conveyor to the west end of the building and thence to the northwest corner where it is tempered, run through a revolving screen and hoisted by boot elevator to the grade of the hoppers from which the machines are fed. From this point it is transferred to the hoppers in quantities as desired, automatically shutting off when hoppers are full. The core and facing sands are handled in a similar way from sand department in northwest corner of building and fed directly upon machines through chutes from hoppers. In the design of drawbars, patterns are so arranged that several different styles of drawbars can be made from one pattern. The head is always the same, master car builders' standard. The shanks, however, vary in design and length and therefore patterns are so designed with detachable blocks that core prints can be attached in some cases, and thus vary the height, length and shape of drawbar shanks. From about six sets of patterns nearly 40 different styles of drawbars can be molded. The great economy in this method of handling patterns must be evident to all foundrymen who are familiar with the cost of metal patterns.

Now, as to the comparison of cost of machine and hand molding: Before the installation of the Maywood molding machines at the Latrobe plant one hand molder at, say, $3 per day with the assistance of one-half helper at, say, $1.75 per day, could turn out at the utmost limit five complete drawbar molds at a total cost for molding of $3.87 or 77.4c per mold. On the machines three men at an average wage of, say, $1.90 per day, and one boy at $1 per day, make a minimum of 65 molds per day at a total cost for labor of $6.70, or 10.3c per mold — a difference in favor of machine molding of 67.1c. Foundrymen will doubtless appreciate the fact that the capacity of these machines would be much greater if making

Horz. Form.

Vert. Form.

## Another place for a COCHRANE SEPARATOR.

Almost every engineer recognizes the absolute necessity for placing an Oil Separator in those exhaust pipes which carry steam for heating the boiler feed water, and for heating water for various manufacturing purposes. It is occasionally noticed, however, that exhaust mains or branches leading to heating systems are not similarly protected, and this does not seem to be good engineering practice, for in a year or so, after the interior of the pipes to the heating system and the radiating surface comprising the system become coated with oil or grease, the latter will work its way back to the boilers through the return pipes.

It may be said that it is not necessary to worry about crossing a river before you get to it, but there are further reasons why the point should receive attention. Why not keep this oil out of the heating system in the first place? It is a well known fact that a thin film of oil upon a pipe surface will prevent the full transmission of heat—and on cold days you may need all the heat you can get. Now a **Cochrane Oil Separator** will remove oil from exhaust steam most effectively. More than 4,000,000 H. P. of boilers are being protected by these appliances.

**Shall we send you our catalogue.**

**HARRISON SAFETY BOILER WORKS, Clearfield & 17th Sts., PHILADELPHIA, PA.**


molds for iron instead of steel, because of the shorter time required for running the former.

On five machines averaging 65 molds each per day this difference above noted in favor of machine molding amounts to $218.07 per day. When, however, we take into account the vastly increased capacity of a given floor space which is effected by the use of these machines and this method of handling it will be seen that the above saving is but part of the total economy achieved. It has been calculated that the use of these machines and methods of handling have more than quadrupled the capacity of this foundry. Another great saving is in the small percentage of bad castings as compared with hand molding. Each machine-made mold is and must be perfect. There is no patching or hand work required after the flasks leave the machine. The cope and drag fit accurately and closely together and the saving in chipping, grinding and finishing is a very considerable item. This saving is especially notable in a steel casting, as being much more fluid than iron, it is more apt to force its way into the slightest break in the joint of the mold. The Latrobe company have been using these machines for more than six months. The plant was designed, equipped and is operated under the superintendence of Mr. T. S. Blair to whom much credit is due for its modernness and efficiency.

### FAILURE OF C. R. BAIRD & CO.

Chester R. Baird, of Philadelphia, conducting business in the manufacture and sale of iron under the name of C. R. Baird & Co. was adjudged a bankrupt in United States District Court on December 26. The liabilities aggregate $1,500,000, and the assets, unofficially, are estimated at $100,000. John N. M. Shimer, of L. & R. Wister & Co., and Attorney William H. Staake were appointed receivers, and each entered security in the sum of $25,000. Ten distinct manufacturing properties, rolling mills and blast furnaces scattered through four states, are involved. These properties are: The Elmira Steel Co., Elmira, N. Y.; the Cumberland Nail & Iron Works, Bridgeton, N. J.; the Fullerton Rolling Mills, Fullerton, Pa.; the Catasauqua Rolling Mill, Catasaqua, Pa.; the Chickies Iron Co., Chickies, Pa.; the Danville Rolling Mill, Danville, Pa.; the Roanoke Rolling Mills, Roanoke, Va., and blast furnaces at Emporium, Pa., and Roanoke and Iron Gate, Va. None of these plants is in operation now, having been closed through legal entanglements precipitated by creditors. Most of them are in the hands of receivers.

The failure is due to the heavy decline in the price of iron the past year. Several banks holding the firm's paper pressed for payment and compelled the action taken. Efforts have been under way for some time to consolidate the various properties Mr. Baird has been acquiring control of in the past year, and Mr. Baird and his attorneys express the belief that they will be successful. Mr. Baird said in an interview: "It is an unusual complication, and although the amount of calculated assets may seem strange, I cannot make a statement until my plan is submitted to creditors. I believe it will be possible to pay dollar for dollar." In a circular recently sent out by the firm the following statement was made:

"We feel confident that our properties and assets, if they are not brought to a forced or hurried sale, but are properly nursed, protected and worked, so as to produce all of the conditions of value and earnings of which they are capable, will be more than sufficient to enable us to pay all of our debts and obligations in full, with interest. The present business commenced in January, 1894, as a commission house for the sale of pig iron. Business was started on a small scale and gradually increased, so that the firm handled the output of a number of large plants in various sections and developed an extensive business. In the latter part of 1898 prices of iron were very low, and many plants suspended operation. As a result, production was inadequate to supply a normal demand, and, confidently believing that the price of this staple article was bound to advance, the firm made large purchases for long future delivery, and also leased or secured options for the purchase of a number of manufacturing plants. In the early part of 1898 prices advanced rapidly, and the contracts men-


## Pig Iron and Foundry Coke

**THE ROBERT FIELD COMPANY,**

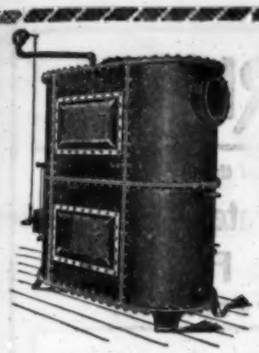
**COLUMBUS, OHIO. ::: ::: ST. LOUIS, MO.**

**AGENTS:**

**The Sloss-Sheffield Steel & Iron Co., in Columbus and St. Louis territories.**

**The Dayton Coal & Iron Co., Ltd., in St. Louis and North West territory.**

**Connellsville and West Virginia Coke.**



Feed-Water Heater.

**FEED WATER HEATERS**

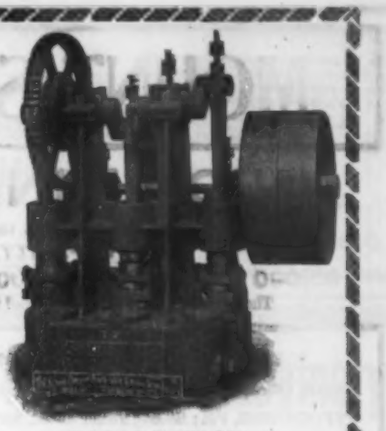
Cut herewith illustrates Stillwell's latest design. Made entirely of cast iron. Saves fuel and filters the feed water for steam boilers. Use only exhaust steam.

**BOILER FEED PUMPS**

SINGLE, DUPLEX AND TRIPLEX.

**AIR COMPRESSORS**

**JET-CONDENSERS-SURFACE**



Triplex Boiler Feed Pump.

IF INTERESTED ADDRESS

**The Stillwell-Bierce & Smith-Vaile Co.,** 227 Lehman Street, DAYTON, OHIO, U. S. A.


tioned proved very profitable. With money thus made the firm bought several large properties, with the ultimate intention of consolidating all of them into one large company."

It is stated that a plan of reorganization is under way providing for a stock company under New Jersey laws, with capital of $1,500,000, to be known as the Baird Iron Co. It is then proposed to issue 20-year 5 per cent bonds for the amount of outstanding claims. Creditors are said to look upon this plan with favor.

### The Bessemer Coke Co. and Mining Rates.

The Bessemer Coke Co., of Pittsburg makes the following statement anent the labor troubles at its Bradenville, Pa., works: "The dispatches sent out from Latrobe and recently published in various papers, represented the Bessemer Coke Co. as trying to reduce the wages of mining in that district to the basis of wages paid in the Connellsville region, which is not the case. It is also claimed that the coal in the Bradenville district is harder than is found in the Connellsville Coke region proper, and on this assumption a higher rate for mining has always been paid in that district; but as a matter of fact the coal in the Bessemer Coke Co's. Duquesne plant, is considerably softer than the coal in at least two of its other mines in the Connellsville region proper, it being necessary to use powder for blasting the coal in the latter two mines, whereas this has never been necessary in mining the coal at the Bradenville works. Coal in the Connellsville region is mined and paid for by measurement while the coal in the Bradenville district is weighed and paid for by the ton. The trouble, according to the statement by a representative of the Bessemer company, grew out of a request from the company to change from the weighing system to the system of measurement, similar to the custom in the Connellsville region, and not from any attempt to reduce the wages.

"The Bessemer Coke Co. only recently acquired the ownership of the Duquesne plant at Bradenville, and has met many difficulties in getting the plant in proper shape for operation. The worst difficulty was the weighing of the coal. The company had requirements for a run of 450 to 500 wagons of coal per day, but only had weighing facilities for about 300 wagons; consequently it was forced to make other arrangements, and the measurement system seemed to be the only clear way out of the difficulty. The wagons used are all the same size, of uniform capacity, and the men were asked to weigh any number of wagons from one to ten or more, if they chose, and take the average weight of the number of wagons as the price to be paid for mining. The wages to be paid for mining, based on this measurement to be continued at the 42 cent rate, which is the prevailing rate paid in this district, the company not desiring to make any change in the mining rate. It was also proposed that these averages of weights were to be made at frequent intervals, if the men at any time so desired. There is always dissatisfaction over the weighing system where coal is mined by weight, over the scales getting out of order, disputes between weighmaster and checkweighman, and many other matters that are detrimental both to the men and company alike, that the management hope to obviate. The change would have perhaps been well for the miners to have tried. The system of paying for mining by measurement where frequent weighing tests could be made to determine averages has many advocates in the Connellsville coke region."

The *Railway Gazette* of Dec. 21, reports new car building as follows: The Pressed Steel Car Co. will build 100 steel flat cars, 100 box cars, and 100 flat-bottom gondola cars for the Rio Grande Western; the Haskell & Barker Co., 2,000 freight cars for the Great Northern; the Illinois Car & Equipment Co., 300 coal cars for the Atchison, Topeka & Santa Fe, and 110 freight cars for the Pittsburg & Buffalo Coal Co.; the Barney & Smith Car Co., 200 gondola cars for the Buffalo


**FOUNDRY COKE.**

We handle the best brands produced in all sections of the United States and are prepared to execute satisfactorily car load orders or yearly contracts.

**It doesn't matter where you live,** we can supply you from the most advantageous producing point.

Send in your inquiries for coke and don't forget us when you want

**PIG IRON.**

**ROGERS, BROWN & CO.,**

CINCINNATI, ST. LOUIS, PHILADELPHIA, BIRMINGHAM, PITTSBURG
BUFFALO, CHICAGO, CLEVELAND, NEW YORK, BOSTON.

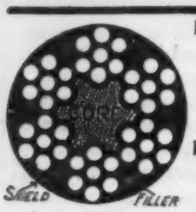
# MOUNT SAVAGE FIRE BRICK.

## UNION MINING CO.

ESTABLISHED 1841.
CAPACITY,
60,000 PER DAY; 18,000,000 PER YEAR.
The First Manufactory of Its Kind in the United States.

Proprietors of the
Celebrated
Mount Savage Fire Brick.
GOVERNMENT STANDARD.

Home Office and Works: MOUNT SAVAGE, Allegany County, Maryland.
Branch Offices: No. 1 Broadway, NEW YORK, N. Y.; Land Title Bldg., Broad & Chestnut Sts., PHILADELPHIA, PA.; Park Building, PITTSBURGH, PA.; Stowe, Fuller & Co., 249 Arcade, CLEVELAND, O.; N. A. Williams Co., 219 E. Washington St., CHICAGO, ILL.




Preserve your
Wire Ropes,
Manila Ropes,
Leather Belts,
Gearing.
Get Catalogue L.
Ironsides Paints for Roofs, Boiler Fronts, Stacks and all metal work.
THE IRONSIDES COMPANY,
Columbus, O., U. S. A.

When writing to advertisers, kindly mention this paper.

## THE GRASSELLI CHEMICAL CO.
Cleveland, O.
MANUFACTURERS OF
STRICTLY CHEMICALLY PURE
Sulphuric Acid,
Hydrochloric Acid,
Nitric Acid,
Aqua Ammonia.

# OTIS STEEL

"OTIS" FIRE BOX PLATES A SPECIALTY.
Flange Plates, Ship Plates, Tank Plates, Steel Car Axles and Forgings of all Kinds.
Steel Castings from 100 to 75,000 lbs.
Head Office and Works, CLEVELAND, OHIO.
Agencies: NEW YORK, 97 Cedar St.
ST. LOUIS, 615 N. Fourth St. WASHINGTON, Kellogg Bldg.
MONTREAL, Homer Taylor, 183 St. James St.
SAN FRANCISCO, John Woodlock, 154-156 First St.

## JEROME KEELEY & CO.,
Established 1869. 421 Chestnut St., PHILADELPHIA
PIG IRON, IRON ORES AND COKE.
Consulting Engineers in Metallurgy and Mining. Steel and Iron Blooms, Muck Bar, etc

Advertisements that are studied, that are to the point and that are frequently changed, bring best results.

Pittsburg is becoming known as a banking and money center as well as a manufacturing point. Its Stock Exchange is the market for most of the iron and steel securities.

## Robert C. Hall,
Member of the Pittsburg Stock Exchange,

will be pleased to secure information or make transactions in these stocks at any time. Phone 3613, or 331 Fourth Ave., PITTSBURG, PA.


& Susquehanna; The Chicago, Milwaukee & St. Paul will build 200 wooden ore cars in its own shops. The Illinois Central, it is said, will build 300 furniture cars in its own shops. The Philadelpha & Reading is reported in the market for 500 box and 500 gondola cars. The Pittsburg, Shawmut & Northern is considering ordering more freight cars.

### EARLY USES OF THE MILLING MACHINE.

The milling machine, of which several forms are illustrated in this issue, is commonly regarded as a modern machine tool, as it has been during the past two or three decades that it has come prominently into use as a general and indispensable tool for the machine shop. However, the use of the revolving cutter and therefore some form of the milling machine, since the revolving cutter is its distinguishing feature, is ancient. There is evidence to show that the teeth of wheels were cut with revolving cutters as early as 1664, by a Dr. Hooke. This interesting bit of machine history, while vague and unsatisfactory as to details, is evidently quite trustworthy. Whether the Dr. Hooke referred to was a doctor of men or a doctor of clocks, we know not, but it is quite evident that the milling machine in various crude forms was quite commonly known and used by the early watch and clock makers. It is also evident that nothing could be more obvious for saving labor in the making of the toothed gearing of time pieces, whether of wood or metal, than a simple indexing device for spacing and a revolving cutter for "notching."

The early clockmakers of New England are credited with being the first users of the milling machine in the United States and the claim seems to be well founded. The toothed wooden wheels of the old "grandfather's clocks" that many a boy now of mature age has had the pleasure of dissecting in his father's woodshed, bore in many instances, unmistakable evidences of some mechanical arrangement for regular spacing and getting uniform width and depth of tooth space.

Upon the advent of the lathe having the rotating spindle, about 1800, the milling machine could be easily adapted by the mere use of a revolving cutter fastened to the spndle. The first milling machine known to have been used in the United States for machine shop operations was at Middletown, Conn., in 1818. It was a lathe headstock set on a suit-

The Wright

Safety Water Column.
Steam Separator.
Exhaust Pipe Head.
Steam Trap.

These goods are unchanged in either the internal mechanism or external appearance, and all patent litigation is ended by the change of names.

THE WRIGHT MFG. CO.

Write for discounts.

RIGHT { In principle. In price.

70-80 Mason st. CLEVELAND, O.

E. R. ALLEN

MANUFACTURER OF

All kinds of soft, fine, medium and heavy Gray Iron Castings to order. Boiler, Heater and Architectural Iron Castings a specialty.

Send for Prices and Estimates.

Corning, New York.

When writing to advertisers please mention The Iron Trade Review.

A large and growing circulation among machine shop and foundry firms has THE IRON TRADE REVIEW

Ore and Coal Handling Machinery

For Blast Furnaces, Docks and Mines,

MINING MACHINERY,

HIGH GRADE HOISTING ENGINES.

WEBSTER, CAMP & LANE MACHINE CO., Akron, Ohio.

Jonestoga Building. EDWARD E. ERIKSON, PITTSBURG, PA.

Regenerative Gas Furnaces and Water Seal Gas Producers.

Producer Gas under Tubular Boilers, saving 20 per cent in fuel. NO SMOKE.

FIRE BRICK.

BRANDS:

O. K. CROWN.
O. K.
A.

SUITABLE FOR

Furnace, Malleable, Mill, Foundry and Lime Kiln Work.

OAK HILL FIRE BRICK AND COAL CO.,

OAK HILL, OHIO.

PHOENIX HORSE SHOES—ARE THE BEST HORSE SHOES MADE

CATALOGUE SENT ON REQUEST.

PHOENIX HORSE SHOE CO., POUGHKEEPSIE, N. Y.—JOLIET, ILL.

The Champion Rivet Co.,

CLEVELAND, O., U. S. A.

Victor Boiler and Structural Rivets

FINISH UNEXCELLED. QUALITY HIGHEST STANDARD.

GOVERNMENT WORK A SPECIALTY.

KENTUCKY FIRE BRICK WORKS.

CUPOLA BRICK.

KENTUCKY FIRE BRICK WORKS, PORTSMOUTH, O. HIGH GRADE FIRE BRICK BLAST FURNACE & ROLLING MILL BRICK

STEEL WORKS BRICK.

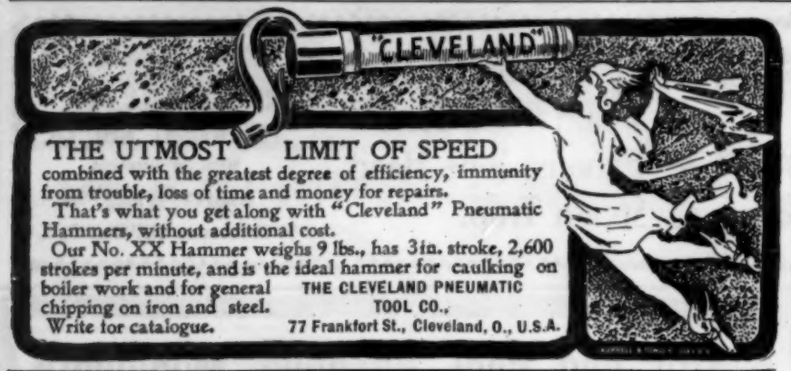
FIREBRICK, KY.

able frame (which would not be highly unsuitable) and provided with a table having a transverse movement.

James Nasmyth, England, made a similar adaptation in 1829, in the shop of Henry Maudslay, the inventor of the slide rest for lathes, for smoothing the sides of hexagon nuts. In this machine the table having a transverse movement carried a vertical index head, having six holes for the six sides of the nut. The cutter appears to have been little more than a circular piece of hardened steel roughed with a chisel before hardening. In fact the revolving cutter was known as a circular file.

The idea of using a lathe for the early milling machines was quite common and seems to have practically been done by one of the early builders of milling machines, a now well-known firm, who in their first machines simply mounted a headstock on the base of a shaper and used the table of the shaper for the platen of the milling machine. Machines made by this firm are in use today, showing unmistakable evidences of this very simple and practical combination.

The primary use of the revolving cutter appears to have been in cutting the teeth of gears, and along these lines the development of the milling machine has generally been until within a comparatively few years. This is, of course, not universally the rule, as the machine referred to in 1818 was a "slabber," but the use of the revolving cutter in this way appears to have been isolated. Gear cutters were built in 1839 by Silver & Gay, North Chelmsford, Mass., and a full automatic machine for gear cutting by Gage, Warner & Whitney, in 1860, both machines using a revolving cutter.—[Machinery.




THE UTMOST LIMIT OF SPEED
combined with the greatest degree of efficiency, immunity from trouble, loss of time and money for repairs.
That's what you get along with "Cleveland" Pneumatic Hammers, without additional cost.
Our No. XX Hammer weighs 9 lbs., has 3in. stroke, 2,600 strokes per minute, and is the ideal hammer for caulking on boiler work and for general chipping on iron and steel.
Write for catalogue.
THE CLEVELAND PNEUMATIC TOOL CO.,
77 Frankfort St., Cleveland, O., U.S.A.

CRUCIBLE CAST TOOL STEEL.
LA BELLE STEEL CO., PITTSBURG.

"ECLIPSE" COLD DRAWN SHAFTING.
FITZSIMONS & CO., CLEVELAND.

COLD ROLLED STRIP STEEL.
MORRIS & BAILEY STEEL CO., PITTSBURG.

BYRON H. WHITE, WESTERN SELLING AGENT.
68-70 SOUTH CANAL STREET, CHICAGO.

STEAM HAMMERS
DOUBLE STAND.
Made Especially for Hammering TOOL STEEL.
Sizes from 400 to 3,000 pounds.
Fitted with our Improved Piston Valve.
Samuel Trethewey & Co., Ltd.,
PITTSBURG, PA.

CRESCENT STEEL
CRESCENT STEEL CO.
480 PEARL ST. NEW YORK PITTSBURGH, PA. 64 & 66 S. CLINTON ST. CHICAGO.

THE MASSILLON IRON AND STEEL CO.
CAST IRON PIPE FOR WATER, GAS & CULVERTS FLANGE PIPE & FITTINGS A SPECIALTY.
THE ROOKERY. CHICAGO, ILL.
CAST IRON PIPE.
ENGINEERS FOUNDERS-MACHINISTS.
HEAVY CASTINGS IN LOAM, GREEN SAND OR DRY SAND FOR BLAST FURNACES ROLLING MILLS, ETC
WORKS & OFFICE MASSILLON, O.

Le Chatelier's
PYROMETER
For measuring temperatures between 0 and 2900° F.
Recommended by the Highest Authorities
Successfully used in establishments for the manufacture of

| | |
|---|---|
| Gas, | Chamotte, |
| Chemicals, | Cement, |
| Sugar, | Accumulators, |
| Terra Cotta, | Incandescent Lamps, |
| Stone Ware, | Cartridges and Ammunition |
| Porcelain, | Glass, |

Iron and Steel, Malleable Iron.
Also by Boiler Inspectors, Schools and Colleges, for hardening and annealing steel in roll oundries, etc.
VULCAN MFG. CO., Ltd.,
Pittsburg, Pa.
Station A.

PETER GERLACH & CO.
MAKERS OF
Saws, Tools and Machinery.
Office and Warerooms, 28 Columbus St.
Factories on Columbus, Winter and Leonard Sts.
Cleveland Ohio U. S. A.

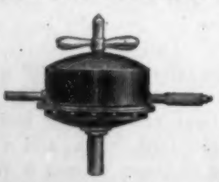
ECONOMIC WATER SUPPLY

TRIPLEX POWER PUMPS
FOR GAS ENGINE OR ELECTRIC MOTOR
PUMPS FOR ALL PURPOSES
THE DEMING Co
SALEM - - - OHIO
HENION & HUBBELL
GENERAL SELLING AGENTS
CHICAGO
THE WORLD'S BEST AUTOMATIC PUMP

"ANALYSES OF PIG IRON."
COLLECTED AND PUBLISHED BY
SEYMOUR R. CHURCH,
307 Sansome St., SAN FRANCISCO.
SEND FOR CIRCULAR.
Price, { $2.50 to U. S. and Canada. / 12s. Foreign Countries. } Postage paid.

MONONGAHELA IRON & STEEL CO.,
Manufacturers of
Charcoal Bar Iron CARTER BRANDS Charcoal Iron Chain
All Sizes
United States Government Specifications Guaranteed.
PITTSBURGH, PA.

Paris Exposition, 1900, confers Highest Award and Two Gold Medals.
ONLY GOLD MEDALS IN THIS CLASS.
CHICAGO PNEUMATIC TOOL CO.,
632-640 Monadnock Bldg., CHICAGO, ILL.


BRANCH OFFICES:
95 LIBERTY STREET, NEW YORK, N. Y. 418 Exchange Bldg., Boston, Mass. 1016 Carnegie Bldg., Pittsburg, Pa. 241 The Arcade, Cleveland, Ohio. 421 Market Street, San Francisco, Cal. Binz Building, Houston, Texas. 605 Fidelity Bldg., Philadelphia, Pa. 316 Lincoln Trust Building, St. Louis, Mo. 416 Hammond Bldg., Detroit, Mich. 508 Equitable Bldg., Denver, Colo.
Pneumatic Riveters, Hoists, Cranes, Jacks, Painting Machines, Motors for every use, Casting Cleaners, etc.

| Hammers | Drills |
|---|---|
| For Chipping Castings. | For Mines. |
| " Calking. | " Quarries. |
| " Riveting. | |
| " Beading. | " Foundries. |
| " Stone Cutting, etc. | |

# FURNACES.

Annealing,
Hardening,
Tempering,
Galvanizing and
Tinning

**Furnaces.**

Wire Baking
and Japanning

**OVENS.**

**Wire Brazing Outfits.**

Write for Catalogue A.

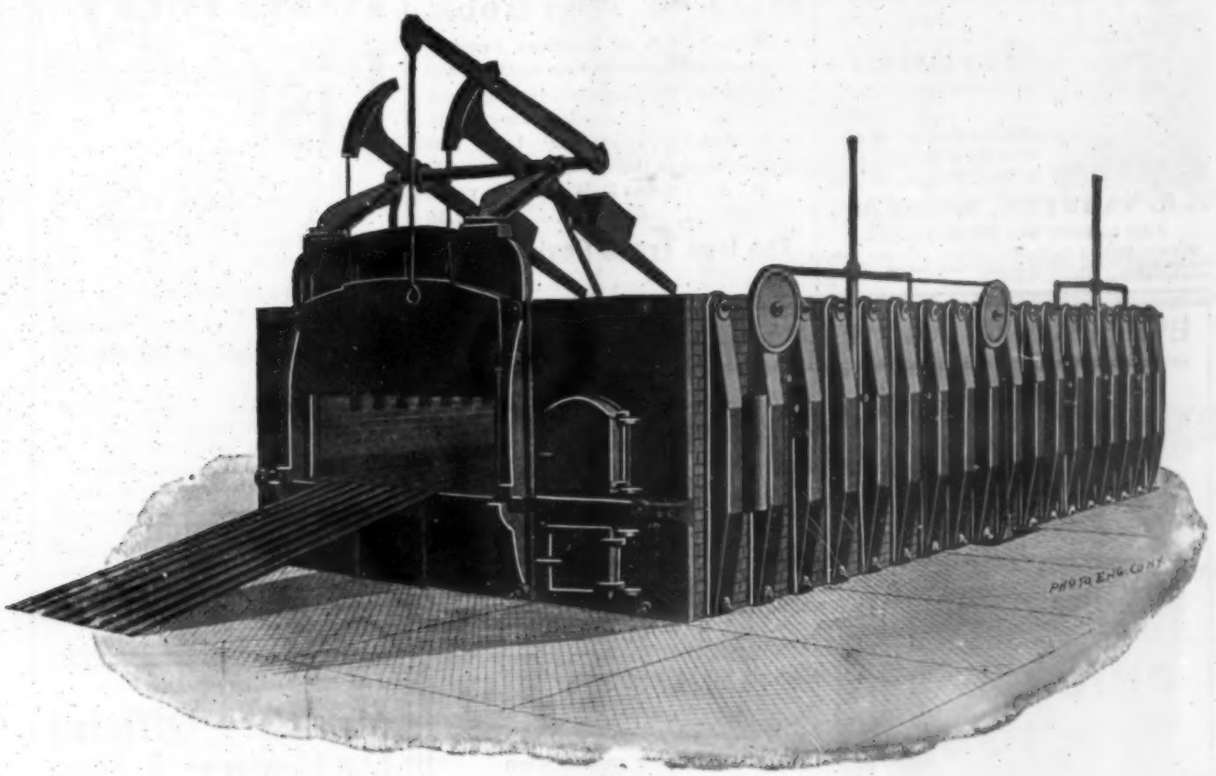
Complete furnace plants installed for heating iron, steel, brass, copper or silver in the most modern and economical manner.

All designs modern, and satisfactory operation guaranteed. . . . .

We also manufacture and install

THE MOST MODERN

**FUEL OIL BURNING APPLIANCES.**



## Rockwell Engineering Co.,

**26 Cortlandt St., NEW YORK.**

# R. D. WOOD & CO.,

400 Chestnut Street,
PHILADELPHIA, PA.

AUTOMATIC PUNCH.

Hydraulic Riveters, *Fixed and Portable.*

PUNCHES,
SHEARS,
CRANES,
PRESSES AND LIFTS.

HYDRAULIC VALVES.

CAST IRON PIPE.

MATHEWS FIRE HYDRANTS.

Gate Valves. Valve Indicator Posts. Pumping Engines. Producer Gas Plants.

## Higley Cold Metal Saws AND Grinders

FOR MILLS, SHOPS, FOUNDRIES, RAILROAD, BRIDGE AND STRUCTURAL WORK

J. R. VANDYCK, Selling Agt.
136 Liberty St., NEW YORK.

McDowell, Stocker & Co., Canal St., Chicago. Niles Tool Works, London, Eng. White, Child & Beney, Vienna, Austria. V. Lowener, Copenhagen, Denmark.

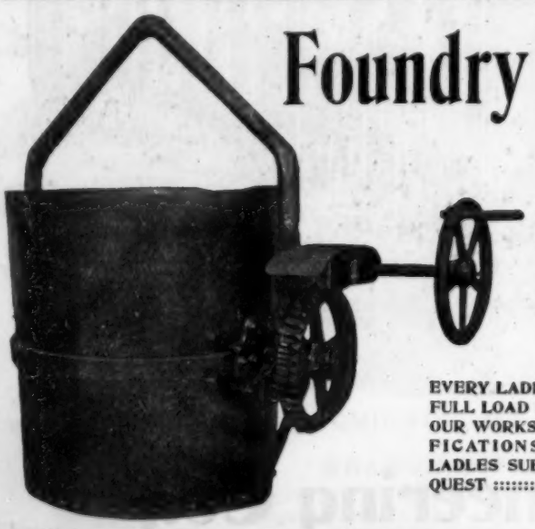
## Molders' Text Book.

Being Part II of American Foundry Practice, giving the best methods and rules for obtaining good castings, with detailed description for making molds. A thoroughly practical book that should be in the hands of every molder. By Thomas D. West. 460 pages cloth..... $2.50

The Iron Trade Review Co.

EVERYTHING YOU NEED IN YOUR FOUNDRY

## Foundry Ladles



HAND LADLES,
BULL LADLES,
GEARED LADLES,

All sizes from 30 lbs. to 30 tons capacity. Ready in stock for delivery.

EVERY LADLE TESTED WITH FULL LOAD BEFORE LEAVING OUR WORKS :::: FULL SPECIFICATIONS FOR GEARED LADLES SUBMITTED ON REQUEST ::::::::::::::::::::::::::::::::

THE S. OBERMAYER CO., CINCINNATI, O. :: CHICAGO, ILL.

Send for our new general catalogue "C"

THE MONTHLY OFFICIAL RAILWAY LIST

# The Monthly Official Railway List

is the oldest, largest, most complete, and by far the most widely circulated publication of its kind in the world.

A Complete Directory of the Steam Railways of North America and their Officials and Sub-officials.

Also a List of the Fast Freight and Private Car Lines and their Officials, and much other information useful to railway men, manufacturers, etc.

The January Issue of the "RED" LIST is now out. If you are a railroad official, you should have received your copy; if you have not, write us for it at once.

THE
Monthly Official Railway List,
315 Dearborn St., CHICAGO.

BUY YOUR ADVERTISING as you do other material, by comparing prices and quality.

Compare the "THIRTY-DAY" List with any other similar publication as regards accuracy and completeness.

## New Foundry Work.

**THE CUPOLA FURNACE,**

A Practical Treatise on the

**Construction and Management of Foundry Cupolas,**

Comprising the Best Methods of Construction and Management of Cupolas; Different Shaped Cupolas; Height of Cupolas; Placing Tuyeres; Lining; Spark Catching Devices; Blowers; Blast Pipes; Air Gauges; Charging; Directions for the Melting of Iron, Tin Plate Scrap and other Metals in Cupolas; Experiments in Melting; What a Cupola Will Melt, etc.

BY

EDWARD KIRK, PHILADELPHIA,

Practical Molder and Melter, Consulting Expert in Melting.

ILLUSTRATED BY SEVENTY-EIGHT ENGRAVINGS

In One Volume, 8vo., 379 pages.

**Price, $3.50.**

Sent postpaid on receipt of price by

The Iron Trade Review Co.


## Cleveland, Lorain & Wheeling,

**Railroad Company.**

Time Table effective Nov. 19th, 1900.
Cleveland Depot: Foot of South Water Street.
Elyria Depot: Huron St., West Side.

| South Bound. | | | Central Standard. Lorain Branch | North Bound | | |
|---|---|---|---|---|---|---|
| 15 | 13 | 11 | | 12 | 14 | 16 |
| P.M. | P.M. | A.M. | LV AR. | A.M. | A.M. | P.M. |
| 4:35 | 1:05 | 7:05 | Lorain ..... | 9:10 | 11:30 | 6:37 |
| 4:40 | 1:20 | 7:20 | Elyria..... | 8:54 | 11:16 | 6:23 |
| 4:56 | 1:38 | 7:41 | Grafton ..... | 8:35 | 10:59 | 6:05 |
| 5:15 | 1:57 | 8:00 | Lester..... | 8:15 | 10:41 | 5:47 |
| 3 | 3 | 1 | Main Line | 2 | 4 | 6 |
| 4:40 | 1:00 | 7:10 | Cleveland .... | 9:10 | 11:40 | 6:40 |
| 4:54 | 1:16 | 7:24 | Brooklyn ..... | 8:54 | 11:24 | 6:26 |
| 5:45 | 2:02 | 8:14 | Lester..... | 8:10 | 10:40 | 5:40 |
| 5:56 | 2:11 | 8:23 | Medina..... | 7:55 | 10:30 | 5:26 |
| 6:19 | 2:30 | 8:43 | Seville..... | 7:33 | 10:10 | 5:05 |
| 6:26 | 2:36 | 8:49 | Sterling..... | 7:27 | 10:04 | 4:59 |
| 6:48 | 2:58 | 9:11 | Warwick..... | 7:05 | 9:42 | 4:35 |
| 6:56 | 3:05 | 9:18 | Canal Fulton | 6:58 | 9:35 | 4:28 |
| 7:16 | 3:23 | 9:39 | Massillon ..... | 6:40 | 9:18 | 4:11 |
| 7:31 | 3:40 | 9:58 | Justus..... | 6:24 | 9:03 | 3:55 |
| 8:01 | 4:11 | 10:26 | Canal Dover. | 5:55 | 8:34 | 3:26 |
| 8:08 | 4:18 | 10:33 | New Philade | 5:48 | 8:27 | 3:18 |
| 8:25 | 4:35 | 10:50 | Uhrichsville | 5:30 | 8:10 | 3:00 |
| | 4:50 | 11:15 | D. " A. ..... | ..... | 8:10 | 3:00 |
| | 6:50 | 1:15 | Bridgeport.... | ..... | 6:10 | 1:00 |
| | 7:05 | ..... | Bellaire..... | ..... | 5:55 | ..... |
| | P.M. | P.M. | AR. LV. | A.M. | A.M. | P.M. |

Sunday Trains between Uhrichsville and Cleveland.

Electric cars Bridgeport to Wheeling, Bellaire and Martins Ferry. Consult agents for best routes and lowest rates to all points.

M. G. CARREL, G. P. A.,
Hickox Bldg., Cleveland.

## Persistent Advertising.

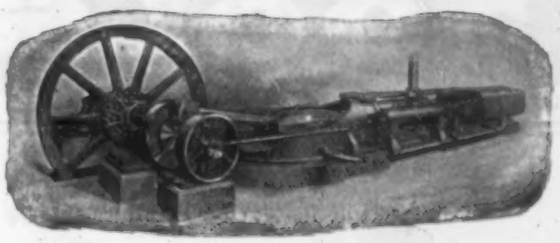
One who watches carefully the pages of general advertising mediums is struck by two things: the persistency with which those advertisers who are recognized as successful maintain their advertising week after week, month after month, and year after year; they never seem to abate their effort, and apparently the volume of their business increases steadily. The other thing noticeable is the large number of advertisers who thrust their announcements above the surface for a little while and then sink into oblivion. They either had not merit as a basis for their claims or they did not possess the skill to steer their enterprise successfully, or else they lacked the nerve to put forth proper effort.—[Advertising Experience.


**The EDWARD P. ALLIS Co.**
MILWAUKEE WIS. BUILDERS
**REYNOLDS CORLISS ENGINES**

BLOWING ENGINES—HOISTING ENGINES—PUMPING ENGINES SPECIAL ENGINES FOR ELECTRIC LIGHTING—STREET RAILWAYS AND ROLLING MILLS
SAW MILL, FLOUR MILL AND MINING MACHINERY

**Southwark Foundry & Machine Co.**
PHILADELPHIA PA.
Porter-Allen Automatic Engines,
Blowing Engines, Centrifugal Pumps,
Weiss Counter-Current Condensers.

# William Tod & Co.
YOUNGSTOWN, OHIO.
**The PORTER-HAMILTON ENGINE.**



Reversing Engines, Blowing Engines, Converters, Hydraulic and special heavy machinery for the iron and steel trades.

PARK BUILDING, PITTSBURG, - - Seward S. Babbitt.

# Iron Castings, Machinery and Forgings
**The GEO. B. SENNETT CO.,**
YOUNGSTOWN, OHIO.
Rolling Mill, Blast Furnace Work and General Machinery.

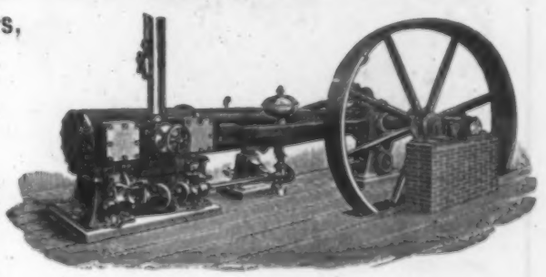
CORRESPONDENCE SOLICITED, AND ESTIMATES PROMPTLY FURNISHED ON ALL KINDS OF MACHINERY, CASTINGS AND FORGINGS.

**THE I. & E. GREENWALD CO.**
Engineers, Founders, and Machinists.

**Steam Engines, Shafting, Hangers, Pulleys, Sprocket Wheels, Chains, etc.**

Headquarters for Mill Gearing of all kinds and sizes. Steam power plants complete.

720 East Pearl St.,
CINCINNATI, O.



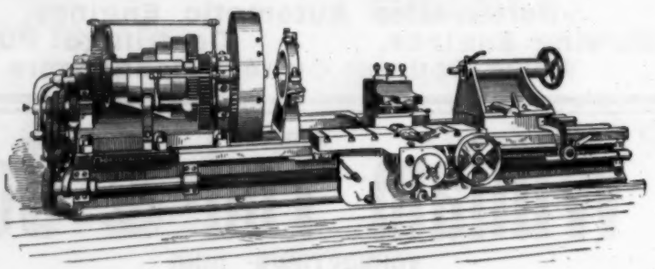
# MACHINE TOOLS

TRADE MACHINERY MARK

LARGE STOCK FOR IMMEDIATE DELIVERY.

High Grade Labor Saving Machine Tools.

NEW AND SECOND HAND.



U·BAIRD MACHINERY CO.

123-125 WATER ST.
124-126 FIRST AVE.

PITTSBURGH PENNA U·S·A·

TRADE PAPER ADV. AGCY. N.Y.-E

We build Single Frame Steam Hammers of the following sizes:

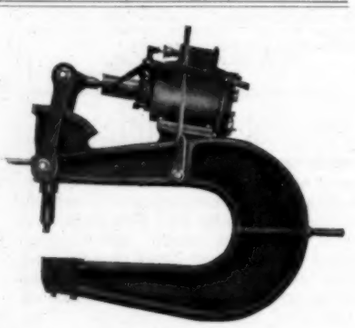
| Sizes | Stroke. | Usual Die Face. | C of Die to Frame. | Steam. | Exhaust. |
|---|---|---|---|---|---|
| 200 lbs. | 16 | 4 x 7 | 12⅛ | 1½ | 2 |
| 250 " | 16 | 4½ x 7 | 12½ | 1½ | 2 |
| 400 " | 19 | 5 x 8½ | 15 | 1½ | 2 |
| 600 " | 22 | 5 x 11 | 17⅛ | 2 | 2½ |
| 800 " | 25 | 6 x 12½ | 20 | 2 | 2½ |
| 1000 " | 28 | 6 x 13 | 22½ | 2½ | 3 |
| 1250 " | 30 | 7 x 13 | 23½ | 2½ | 3 |
| 1500 " | 33 | 7 x 14½ | 25 | 2½ | 3 |

WE BUILD

Jaw and Compression

Riveters

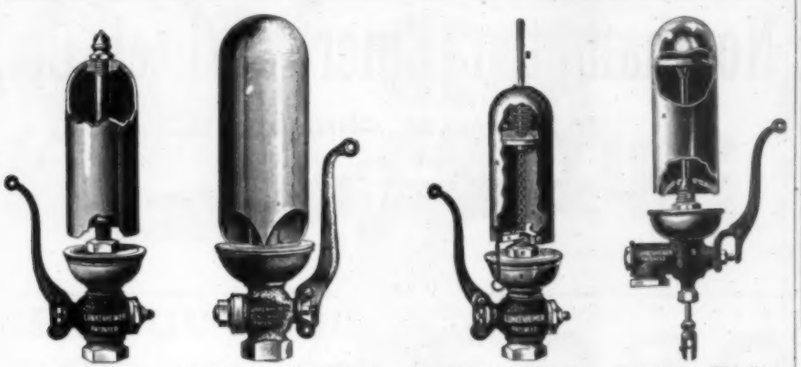
For operating by Compressed Air or Steam.



AMERICAN ENGINEERING WORKS,

1538 Marquette Bldg., :- :CHICAGO, ILL.

IN COMPETITION WITH THE ENTIRE WORLD.
THE ONLY
GOLD MEDAL
GIVEN AT THE
PARIS EXPOSITION, 1900
FOR EXHIBITS OF
VALVES AND FITTINGS
WAS AWARDED TO
CRANE CO.
NEW YORK
PHILADELPHIA
CINCINNATI
KANSAS CITY
SIOUX CITY
OMAHA
CHICAGO
ESTABLISHED 1855
ST. PAUL
ST. LOUIS
LOS ANGELES
SAN FRANCISCO
PORTLAND, ORE.
WRITE FOR POCKET CATALOGUE



Plain Whistle 1 to 10 in. diameter of bell. | Single Bell Chime Whistle 1½ to 10 inches. | Mocking Bird Whistle 2½ to 6 inches. | Fire Alarm Whistle 2½ to 6 inches.

THE LUNKENHEIMER STEAM WHISTLES.
All warranted to blow and to satisfy the most exacting. All goods tested and warranted first-class. Specify Lunkenheimer make and order from your dealer. Write for catalog of superior brass and iron engineering appliances.
THE LUNKENHEIMER CO., :: Sole Makers and Patentees, :: CINCINNATI, O., U.S.A.
BRANCHES—New York, 26 Cortlandt St. London, 35 Great Dover St., S. E.

PLATE STEEL MELTING LADLES.
All sizes, from 3 to 12 inches outside diameter.

Made of ¾ plate and thinner, according to size of ladle. Stronger and safer than cast iron.
THE W. J. CLARK CO.,
Salem, Ohio.
Plate and Sheet Metal Workers.

Jenkins Brothers' Valves
are manufactured of the best steam metal, and are fully guaranteed. Why experiment with cheap valves? If you want the BEST ask your dealer for valves manufactured by Jenkins Brothers. Remember all genuine are stamped with Trade Mark like cut. (1)
JENKINS BROTHERS, New York, Philadelphia, Chicago, Boston.

Between the Lakes and the Gulf, the Mississippi and the Allegheny Mountains—the best buying section of the United States—is the BULK of THE IRON TRADE REVIEW'S circulation. In this section advertisers in all trade papers get best returns.

One Man
with a Carborundum Wheel will do as much work as two, or three, or four men with other abrasives—
and do it better.
Carborundum not only cuts faster and cleaner than other abrasive wheels, but it lasts longer.
It does not grow smooth or gummy—
The cutting edge is always fresh and sharp.
It does not heat the work.
It costs a little more in the first place, but in the long run is by far the cheapest abrasive in use.
May we prove all these things to you?
The Carborundum Company,
Niagara Falls, N. Y.

OF INTEREST TO
Manufacturers
Write for copy of pamphlet just issued by the
ILLINOIS CENTRAL R.R.
COMPANY
giving reliable information concerning nearly 200 desirable locations for industries, and entitled
INDUSTRIAL SITES IN TEN STATES
Address GEO. C. POWER,
Industrial Commissioner, Illinois Central Railroad
Room 506, Central Station, CHICAGO, ILL.

Subscribe for
THE IRON TRADE REVIEW.

M. ALLEN, President.

WM. B. FRANKLIN, Vice-President.

F. B. ALLEN, Second Vice-President.

J. B. PIERCE, Secretary and Treas.

HARTFORD STEAM BOILER INSPECTION AND INSURANCE CO. HARTFORD, CONN.

BURWELL & BRIGGS, General Agents, 32 and 33 Clark Bldg., 208 Superior St., Cleveland, O.

C. A. BURWELL, Chief Inspector, 32 and 33 Clark Bldg., 208 Superior St., Cleveland, O.

J. E. WOLCOTT, Special Agent, 32 and 33 Clark Bldg., 208 Superior St., Cleveland, O.

## Locations for Industries.

The name of the Chicago, Milwaukee & St. Paul Railway has long been identified with practical measures for the general upbuilding of its territory and the promotion of its commerce, hence manufacturers have an assurance that they will find themselves at home on the company's lines.

The Chicago, Milwaukee & St. Paul Railway Company's 6,300 miles of railway, exclusive of second track, connecting track or sidings, traverses eight states, namely:

| | | |
|---|---|---|
| NORTH DAKOTA | MINNESOTA | NORTHERN MICHIGAN |
| SOUTH DAKOTA | IOWA | WISCONSIN |
| Express Passenger Trains Fast Freight Trains Throughout. | MISSOURI | ILLINOIS |

which comprise a great Agricultural, Manufacturing and Mining territory.

The Chicago, Milwaukee & St. Paul Railway Company gives unremitting attention to the development of local traffic on its lines and, with this in view, seeks to increase the number of manufacturing plants on its system either through their creation by local enterprise or the influx of manufacturers from the East. It has all its territory districted in relation to resources, adaptability and advantages for manufacturing. Specific information furnished manufacturers in regard to suitable locations. Address,

**LUIS JACKSON,**
Industrial Commissioner, C. M. & St. P. R'y.
Old Colony Building, Chicago, Ill.

## Persistence In Advertising

Is one of the requisites of satisfactory results. In the expansion of business which is now noticeable in every section of the country, advertisers who have made themselves regularly prominent in the past two years will be first to reap the rewards of persistent publicity.

FOR GREAT TENSILE STRENGTH, ELASTICITY AND ELONGATION, COUPLED WITH UNUSUAL NON-CORROSIVE QUALITIES.

# Castings and Propeller Wheels

Made from

## PARSONS MANGANESE BRONZE

Cannot be excelled. Write for Particulars.

SOLE MAKERS

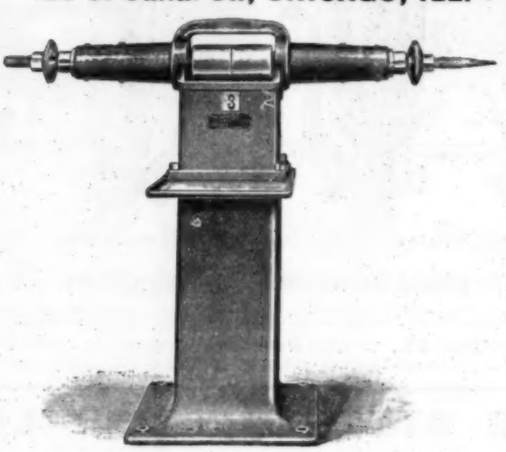
# THE WILLIAM CRAMP & SONS'

## Ship and Engine Building Company,

PHILADELPHIA, PA.

# Northampton Emery Wheel Co.,

20 S. Canal St., CHICAGO, ILL.



BUFFER No. 3.

Length of arbor over all, 52 inches. Length between flanges, 40 inches. Diameter of arbor through bearings, ¾ inch. Diameter through collars, 1 inch or 1¾ inch. Pulleys, 4 inch x 4 inch. Height from floor to center of arbor, 39 inche

COMPLETE CATALOGUE ON APPLICATION.

## Who builds the best Mine Pump?

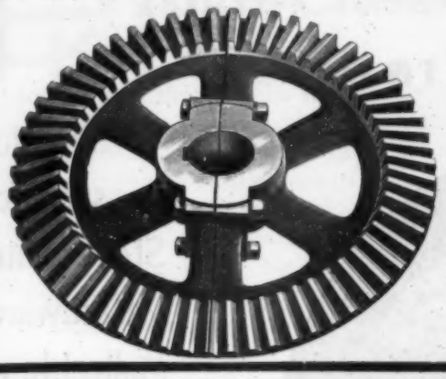
# PRESCOTT.

## Fred. M. Prescott Steam Pump Co.,

MILWAUKEE, WIS.

**The Iron Trade Review** is an increasingly valuable medium, through which to sell equipment to machine shop and foundries.

# Bevel or Mitre Gears

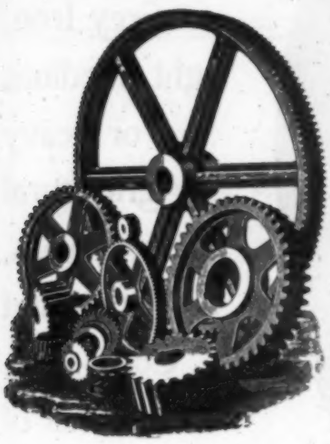


Are made in different ways; sometimes with the teeth cast necessarily imperfect in fit, wasteful of power and extravagant in ultimate cost. The next, rough cut and hand finished, a great improvement, but not up to the mark yet.

We use special machines and plane the teeth theoretically correct, so that the maximum economical limit is attained.

We would like to figure with you for this class of work and can cut up to eight feet diameter.

R. D. NUTTALL COMPANY,
Pittsburgh, Pa.



THE VAN DORN & DUTTON CO.,
CLEVELAND, OHIO.
General Machinists and Engineers.

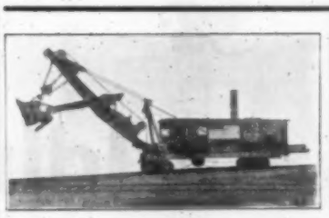
GEAR CUTTING
of all descriptions.

WE MAKE
GEARS
of Steel, Malleable Iron, Cast Iron, Brass and Rawhide.

GEAR CUTTING.
Spur Gears,
Bevel and Mitre Gears,
Worm Gears,
Spiral Gears,
Internal Gears.
¼ to 50 inches diameter.
48 Diametral to 2 inch Circular pitch
F. H. BULTMAN & CO.,
100-108 Canal St., CLEVELAND, O.

A large and growing circulation among machine shop and foundry firms, has
THE IRON TRADE REVIEW

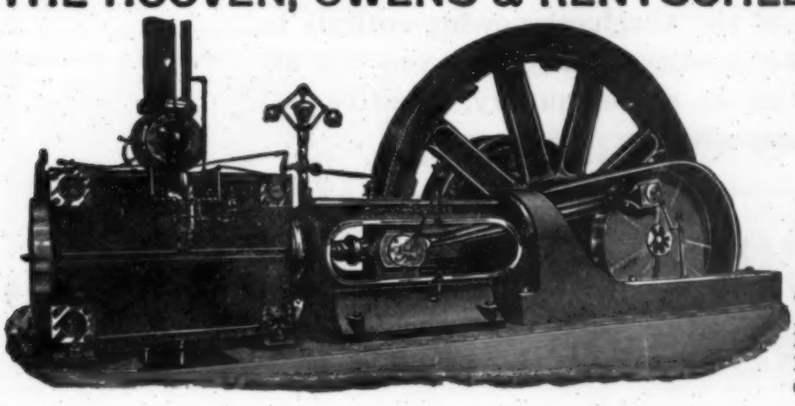
FORGINGS
JAS. H. BAKER MFG. CO., Pittsburg, Pa., U. S. A.



The Bucyrus Company, South Milwaukee, Wisconsin.
Steam Shovels and Dredges.
Placer Mining Machinery of the Elevator Bucket Type Railroad Wrecking Cars and Pile Drivers. Centrifugal Dredging Pumps.

"Metallurgy of Cast Iron." Price $3.00.

THE HOOVEN, OWENS & RENTSCHLER CO., HAMILTON, O.



Hamilton Corliss Engines.

Engines for Rolling Mills, Electric Railways and Electric Light.

Engines of all sizes and for all purposes.

46 South Canal St., Chicago.
39 and 41 Cortlandt St., New York.
Lewis Block, Pittsburgh, Pa.
Room A, Laclede Bldg., St. Louis, Mo.
C. C. Moore & Co., San Francisco, Cal.

# OUR COMMERCIAL TOURIST

**REPRESENTING**

The Entire Ohio Valley product of

## MOLDING SAND

The largest body of superior Molding Sand under one control, together with 6,300 feet of railway siding, making an unlimited capacity.

Master Van Dye

Superior sand for Stove plate, Hardware, Malleable or Grey Iron, light, medium or heavy Agricultural work, Brass and Core sand, all of which have yet to find their equal.

# Standard Molding Sand

IN USE FOR FIFTY YEARS.

**While our trade has grown to be the best west of the Alleghanies owing entirely to the superior quality of our sand, you can always rely on us, as our quality, quantity and shipping capacity are not equaled . . . . . .**

# The Newport Sand Bank Co.,

NEWPORT, KY.

## High-Class Mechanical Illustrations

Do you realize what it means to produce a perfect half-tone of machinery or any mechanical subject that will be satisfactory in every way. The artist who makes the wash-drawing or retouches the photograph,, the photographer, the printer, the finisher or any one of the score of men through whose hands the plate must pass before completed, can make or mar the result, according to his skill or lack of skill. Our rare success in the production of high-class mechanical illustrations can be credited to the careful selection and organization of our working force. From the artists up, every man knows his business and every job is handled to the best of his ability.

You cannot do better than to entrust your engraving work to our hands. Some of the largest manufacturing concerns in the country give us their work in this line, leaving the method of handling entirely to our judgment.

**ROSENOW & CO. Engravers,**
**371 Dearborn Street, CHICAGO**

## He Needs Change.

Perhaps the gentle reader needs a change in the source of supply of his

**Polishers' and Platers' Supplies.**

I manufacture a complete line of

***Tripoli Compositions, Crocus Compositions, English Rouge, Felt Wheels, Cotton Buffs, etc.***

The Detroit Lubricator Co. say they are much pleased with our Tripoli Composition. The Fanner Mfg. Co., Cleveland, say it is the best there is. . . . . .

I have "Everything for a Foundry."

**F. B. STEVENS,**
Cor Griswold & Atwater Sts., DETROIT, MICH.

## FACINGS.

Foundry Supplies.

PERFECTION CORE BOXES

**Cleveland Facing Mill Co.,**
CLEVELAND, O.

**DROP FORGINGS.....**
OF EVERY DESCRIPTION.

E. D. CLAPP MFG. CO.,
Established 1864. Auburn, N. Y.

## BERGER'S METAL CEILINGS

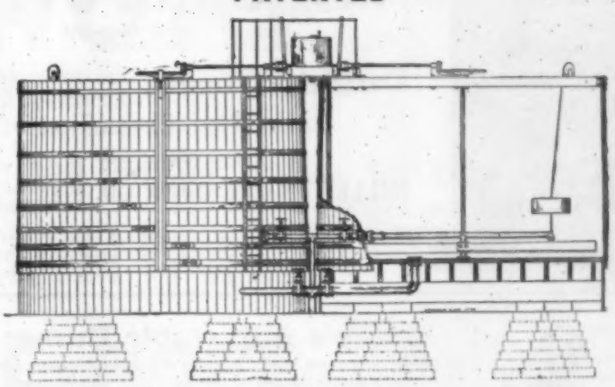
Deepest stamped. Most artistic. The only ones in Classified Designs. Write to-day for details. THE BERGER MFG. CO., Canton, O

THE

## "Scientific" Water Softening Plant

PATENTED

7,500,000 gallons capacity in daily use.



HONEST GUARANTEE.

furnishes clear, soft feed water for boilers.

**THE WEFUCO CO., Cincinnati, O.**

Established 1879.

## THE OHIO SAND COMPANY.

SHIPPERS OF ALL GRADES OF

**MOULDING SAND.**

Our Sand is SECOND TO NONE. Banks at Conneaut and Kingsville. Samples and Prices on Application.

Conneaut, Ohio.

**BEST MANUFACTURING CO., Pittsburg, Pa.**

**Brass and Iron Founders,**

**Pipe Fitters and Machinists,**

Manufacturers of **Best Gate Valves** For High and Low Pressure.

---

Henry M. Atwood, President. C. A. Anderson, Treasurer.
J. T. Speer, Vice President. Moses Atwood, Sec'y and Sales Agent.
Geo. E. Klingelhofer, Gen'l Mgr.

# PITTSBURG VALVE, FOUNDRY AND CONSTRUCTION CO.

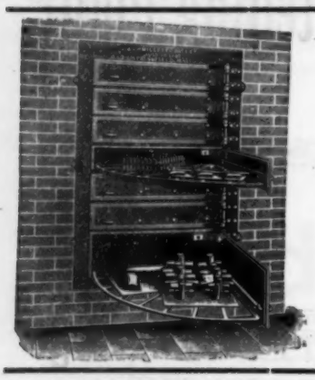
Offices: Empire Building, PITTSBURG, PA.

**Engineers, Founders, Pipe Fitters and Machinists.**

**CONSTITUENT FIRMS:**

Atwood & McCaffrey,
Pittsburg Valve & Machine Co., Ltd.
Shook-Anderson Mfg. Co.
Pipe Fitting Department of Wilson-Snyder Mfg. Co.
Foundry of A. Speer & Sons.

---



MILLETTS' PATENT **CORE OVEN**

No one who makes small cores can afford to be without it. . .

**Double Doors,** One closing the oven when the other is open.

**Saves Fuel, Saves Time.**

SEND FOR CIRCULAR.

**MILLETT CORE OVEN CO.** Brightwood, Mass.

The ovens can be seen in the sample rooms of the S. Obermayer Co., either in Cincinnati or Chicago, and in the show rooms of J. W. Paxson & Co., Philadelphia.

England Agents: J. W. Jackman & Co., 39 Victoria St., London, S. W.

---

**Drake's Adjustable Burner**

Can be turned down from a full size flame to one candle power by means of the little valves, one of which may be closed entirely and the other one reduced to a flame as small as desired for a night light without smoking, carbonizing or producing a sluggish flame.

The diverging stems are so arranged that they can be turned into alignment in an instant.

The points of the little valves may be forced up through the little hole where the gas is liberated from the rear, removing any obstruction without being obliged to extinguish the whole flame.

Patents pending in the United States, Canada and Principal Countries of Europe.

Manufactured and For Sale only by the

**DRAKE ACETYLENE APPARATUS CO.,**
**Or Its Agents,**
**32 Hathaway St., CLEVELAND, O., U. S. A.**

---

IT PAYS TO ADVERTISE IN THE IRON TRADE REVIEW.

---

**THE DAILY METAL MARKET REPORT**

Published by

**THE REPORT CO.,**

**Room 79, 99 John St., New York.**

Gives daily reports of foreign and domestic metal markets. Shows daily fluctuations in all metals, both in this country and in Europe. Contains the latest news affecting the market for Pig Iron, Steel, etc. Write for sample copy. We guarantee a circulation greater than the combined circulation of all competitors. As an advertising medium for reaching the Iron, Steel and Metal producers and consumers it has no superior.

---

SECOND EDITION

**CREMER & BICKNELL'S**

**Chemical and Metallurgical HANDBOOK**

EXTRACT FROM PREFACE:

In the preparation of the second edition of our Handbook, the general plan of the first edition has been followed, viz., to present in concise form such data and information as are useful to the chemist and metallurgist. Several tables of the first edition, which were of somewhat limited use, have been omitted, while more than one hundred pages of new matter have been added.

The methods for analysis of iron ore, iron and steel and for assaying have been given briefly, but perhaps as much in detail as is consistent with the general scope of the book. Several changes and additions to the Specific Gravity tables have been made by adoption of later and more accurate values.

In the notes on blast furnace practice have been outlined the more important theoretical and practical points, which, it is hoped, will be of some service to those interested in the manufacture of iron.

The hygrometric table gives the necessary information for determining the amount of moisture in air, a subject whose importance in metallurgical operations is being more fully recognized at present than heretofore. This table is new and is based on the most accurate data available at the present time.

The tables of weights and measures, United States and foreign, have been very much amplified, and the conversion tables for United States and metric weight and measures of the U. S. Coast and Geodetic Survey included, the latter being based on the legal standard for this country.

Numerous miscellaneous tables have been added, which, it is hoped, will be found of value

Seal Morocco, - - $3.00

Sent postpaid on receipt of price

by

**The Iron Trade Review Co.,**

CHICAGO. CLEVELAND. PITTSBURG

# ARMSTRONG MAN'F'G. CO.

WATER GAS AND STEAM FITTERS TOOLS

BRIDGEPORT, CONN.

**New York Office, 139 Center Street.**

The well merited reputation attained by our goods is our guarantee of their superiority. If you cannot get them of your dealer send to us for catalogue and prices.

## FOR TESTING IRON ORE BODIES

or drilling deep test holes in ANY formation—gravel, boulders and rock. Drives 4, 6, 8 or 10-inch pipe, or drills holes that size in rock, and

**Produces at the Surface Everything Found.**

Tests for gold, lead, zinc, coal—everything. Can be used on boat, to explore river beds to bed rock. Water no hindrance. Drills water and oil wells quickly, cheaply and without skilled labor. Self-moving: complete.

Write for full information and catalogue.

**THE KEYSTONE DRILLER CO.,**
**BEAVER FALLS, PA., U.S.A.**

There are plenty of Chucks but only one

## Pratt Chuck.

That holds the Drill so it cannot slip. The Pratt Positive Driving Drill Chuck is an indispensable to the thorough equipment of a well-managed machine shop. . . . . .

See Our Free Booklet No. 2 Describing It.

**PRATT CHUCK COMPANY, Frankfort, N. Y., U. S. A.**

## WATERBURY ROPE CO.,

Factories: Brooklyn, N. Y. Office: 69 South St., New York.

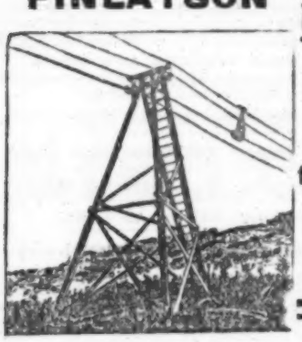
MAKERS OF

# WIRE ROPE

OF ALL KINDS. ALSO

Manila, Sisal, Russia and American
Cordage and Binder Twine, and
"WATERBURY" Transmission and Hoisting Rope.

**FINLAYSON** WIRE ROPE **TRAMWAYS**



ALSO

# WIRE ROPE

for Hoisting, Haulage, Transmission, etc.

MANILA, SISAL, ETC.

**A. LESCHEN & SONS ROPE COMPANY,**
N. Main Street, ST. LOUIS, MO.
47 S. Canal Street, CHICAGO, ILL.

**Subscribe for The IRON TRADE REVIEW, $3 per year.**

## SHEAR-ROTARY.

Cuts Outer Circles.
Cuts Straightaway.
Cuts many times faster than any other type of shear.

SEND FOR CATALOG.

**Bethlehem Foundry & Machine Co.,**
SOUTH BETHLEHEM, PA.

## NUTS.. AND BOLTS

**National Elastic Nut Co.,**
MILWAUKEE, WIS.

We make a specialty of Square and Hexagon Hot-Pressed Nuts (Elastic and Common); Machine Bolts, Track Bolts, etc., to large users at lowest prices. Our Elastic Self-Locking Steel Nut never works loose, and is the strongest, best and cheapest Nut on the market. Our Elastic Nut Track Bolt makes the best Rail fastening. Write for prices.

## Machinery For Reducing and Pointing Wire By Compression or Cold Swaging.

Especially adapted to Pointing Wire Rods and Wire for Drawing. For machines or information, address

**S. W. GOODYEAR,**
Waterbury, Conn.

## COVERT MFG. CO.,

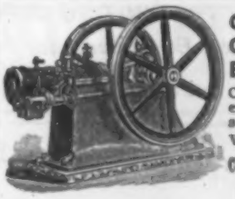
West Troy, N. Y.

## "Yankee" Snaps

Made in Styles and Sizes.

For Sale by Jobbers at Manfrs. Prices.

**COVERT MFG. CO., West Troy, N.Y., U.S.A.**



## GAS AND GASOLINE ENGINES.

Cheap and convenient power for any service.

Write for catalogue

**COLUMBUS MACHINE CO.**
COLUMBUS, O.

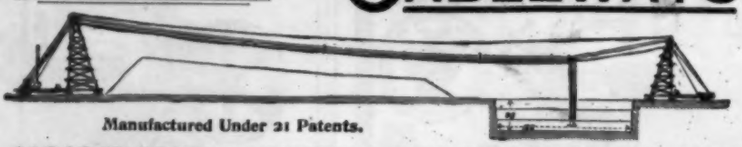

## The Cleveland Terminal & Valley R. R. Co

(B. & O. System.)

| Depot foot of So. Water St. City Office 241 Superior St. | Arrive. | Depart. |
|---|---|---|
| Valley Jctn. & Way Stations.. | *6:20 P M | *7 15 A M |
| Wheeling & Chicago..... | *2:35 P M | †7 15 A M |
| Akron, Canton & Chicago..... | *8:10 A M | *9 35 P M |
| Akron, Canton & Wheeling... | *10 00 A M | *3.25 P M |
| Akron, Canton & Chicago..... | *8:10 A M | *6:35 P M |
| Akron, Canton & Marietta.... | †2:10 P M | †11:00 A M |
| Pittsburg, Washington, D. C., & Baltimore..... | *10:45 A M | *3:10 P M |

†Daily except Sunday. *Daily. Pullman's Palace Vestibule sleeping cars between Cleveland and Chicago, also Washington, Baltimore and Philadelphia.

## LIDGERWOOD CABLEWAYS



Manufactured Under 21 Patents.

**HOIST AND CONVEY LOADS UP TO 20 TONS**
FOR THE CONSTRUCTION OF DAMS, PIERS, WALLS, SEWERS, CANAL EXCAVATING, ETC.

*Send for book, "Lidgerwood Cableways."*

STEAM AND ELECTRIC HOISTS. **LIDGERWOOD MFG. CO.** 96 Liberty St., NEW YORK.

Malleable Iron Buckets of Approved Pattern and Weight.

## LINK-BELT Elevators and Conveyors.

for handling Slabs, Billets, Bar Iron, Coal, Ashes, Cement, etc. Shafting, Pulleys, Patent Machine-moulded Rope Sheaves, Clutches, etc.

**LINK-BELT MACHINERY CO.,**
ENGINEERS, FOUNDERS, MACHINISTS.
Chicago, U. S. A.

LINK BELT ENGINEERING CO., PHILADELPHIA and NEW YORK.

## CRANES

Electric, Steam and Hand Power. Traveling, Jib and Locomotive types.

NORTHERN ENGINEERING WORKS.

Works and Main Office, No. 6 Chene Street, DETROIT, MICHIGAN.
CLEVELAND OFFICE, Chas. E. Stamp & Co., New England Bldg.

## CRANES

• HIGH • SPEEDS •
• ELECTRIC • STEAM • HAND •
• MACHINERY FOR HANDLING COAL AND ORE

THE BROWN HOISTING MACHINERY CO. Works, Cleveland, O.
NEW YORK, 26 Cortlandt Street. LONDON, 39 Victoria Street, S. W.

## THE CLEVELAND CRANE AND CAR CO

CRANES OF ALL KINDS FOR ALL PURPOSES

SUPERIOR ST. CLEVELAND O.

## Cranes

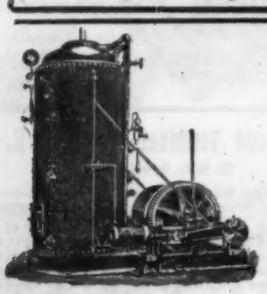
***ENGINEERS and DESIGNERS of FOUNDRY PLANTS.***

***Cranes*** for any service. ***Air Hoists.***

*The WHITING CUPOLA, 15 Sizes, 600 in Use.*

*Complete Equipments for Foundries.* *Catalogs Free.*

Whiting Foundry Equipment Co. Harvey, Ill., U. S. A. (Chicago Suburb.)



## THE EXETER MACHINE WORKS,

Pittston, Pa.

MANUFACTURERS OF

## High Grade Hoisting Engines,

Elevating and Conveying Machinery.

**Subscribe for the Iron Trade Review, $3.00 per year.**

## PYROMETERS

**Edward Brown,**

ESTABLISHED 1850.

311 WALNUT St., PHILADELPHIA

Manufacturer and Patentee OF THE

**Hot Blast (or Graphite) Pyrometer.**—The only stationary Pyrometer now in use durable over 700 degrees.

**The Standard Portable Pyrometer**—For Blast Furnaces.

**Mercury Revolution Indicator.**—Centennial Exhibition Medal. Accurate for all time.

**Annealing Oven Pyrometer**—to 3,000 degrees—of 1893.

**Tin-plating Pyrometer**—of 1894.

**Mercury and Steam Gauges.**

## The Iron Founder Supplement.

A complete illustrated exposition of the art of casting in iron, comprising the erection and management of cupolas, reverberatory furnaces, blowers, dams, ladles, etc., mixing cast iron, founding of chilled car wheels, malleable iron castings, foundry equipments and appliances, gear molding machines, molding machines, burning, chilling, softening, annealing, pouring and feeding, foundry materials, advanced molding, measurement of castings wrought iron, steel, etc. Also the founding of statues, the art of taking casts, pattern modeling, useful formulas and tables. By SIMPSON BOLLAND. Illustrated with over 200 engravings; 400 pages; 12mo; cloth . . . . . $2.50

Sent postpaid on receipt of price by

**The Iron Trade Review Co.,**

CHICAGO. CLEVELAND. PITTSBURG

## WEST AND SOUTH

run the lines of the Illinois Central Railroad and the Yazoo & Mississippi Valley Railroad, reaching into the eleven States of

South Dakota, Minnesota, Iowa, Wisconsin, Illinois, Indiana, Kentucky, Tennessee, Arkansas, Mississippi, Louisiana

Presenting an unequaled territory for diversified industries, and possessing

**Fine Sites for New Mills**

**Best of Freight Facilities,—Coal Fields,**

**Close Proximity to Distributing Centers**

**Intelligent Help of All Kinds,**

**Many Kinds of Raw Material.**

To sound industries, substantial inducements will be given by many of the places concisely described in the pamphlet "100 Cities and Towns Wanting Industries." Write for a copy. Nearly all kinds of industries are wanted. Very liberal inducements are offered TEXTILE INDUSTRIES in the South by a number of good places. GEORGE C. POWER, Industrial Commissioner C. R. I. R. Co., Chicago

## A B C OF IRON.

NOW $1.00.

# PERFORATED METALS

PERFORATED IRON, STEEL COPPER, BRASS, TIN, ZINC, LEAD, ETC. MADE TO ORDER

LARGE & VARIED ASSORTMENT OF SIZES

CORRESPONDENCE SOLICITED

THE ROBERT AITCHISON PERFORATED METAL CO.
303-305 DEARBORN ST. CHICAGO, ILL.

**PERFORATED PLATE SCREENS**
AS REQUIRED FOR
STONE, ORE, ZINC, LEAD, and all Railroad and Mining Uses.
Special Screens for COAL and COKE.
THE HENDRICK MFG. CO., LTD.,
Samples and information upon request.
Carbondale, Pa.

SCIENTIFIC MFG. CO.,
The Rookery,
CHICAGO.

COMMERCIAL DECALCOMANIAS

JULIAN KENNEDY, ENGINEER,
PITTSBURG, PA., U. S. A.
Machinery for the economical
PRODUCTION OF IRON AND STEEL.
Consultations and expert work in
GENERAL ENGINEERING PRACTICE.
Cable address "ENGINEER PITTSBURG."

The Wellman-Seaver Engineering Co.,
CONSULTING AND CONTRACTING ENGINEERS.
NEW ENGLAND BLDG.,
CLEVELAND, OHIO, U. S. A.
Steel Works, Rolling Mills, Metallurgical Furnaces, Manufacturing Buildings, Machinery for the most economical handling of all kinds of material.
CABLE ADDRESS
"WELLSEA" CLEVELAND.
Sole manufacturers of PORTER WATER SEALED REVERSING VALVES and FRASER-TALBOT MECHANICAL GAS PRODUCERS.
LONDON OFFICE: 47 VICTORIA STREET, WESTMINSTER.

STEEL CONSTRUCTION
in All Branches
BUILDINGS DESIGNED AND ERECTED
in all parts of the world
ROOF FRAMES AND TRUSSES
CUPOLAS, LADLES, CONVERTERS
BLAST FURNACES AND STEEL WORKS
BOILERS, TANKS, AND HEAVY PLATE WORK
RITER-CONLEY MFG. CO., PITTSBURG, PA.

FRASER & CHALMERS,
556 Washtenaw Ave.
CHICAGO, ILL.

Perforated Metals, Comet Rock Crushers, Mining and Ore Treating Machinery.
Sole Makers of REIDLER PUMPS.

United Boiler Co.
GIRARD, OHIO.
Tanks, Boilers, Stills, Blast Furnaces, Heaters, etc., etc.
BOILER MAKING IN ALL ITS BRANCHES.
Repairs Promptly Attended to. Long Distance Telephone. New Work or Estimates.

Blast Furnaces
Constructed
with
Automatic Filling Apparatus.
Require no Top Fillers.
WALTER KENNEDY,
ENGINEER,
631 Penn Ave., PITTSBURG, PA.

Alex Laughlin & Co.,
Engineers and Contractors.
702-706 Lewis Block,
PITTSBURG, PA.

DAVID LAMOND,
Contracting Engineer,
Ferguson Block, - PITTSBURG, PA.
Blast Furnace Construction.
Agent for C. H. Foote Patent 3 and 4 Pass Fire Brick Stove.

THE IRON TRADE REVIEW
Is an increasingly valuable medium through which to sell equipment to machine shops and foundries.

**A. Garrison Foundry Co.,**

PITTSBURG, PA.

MANUFACTURERS OF

**SAND and CHILLED ROLLS, and ROLLING MILL CASTINGS**

of every description.

AETNA & CORLISS ROLLING MILL ENGINES
THE TOTTEN & HOGG IRON & STEEL FOUNDRY CO.
OFFICE & WORKS
24TH ST. & A.V.R.R.
PITTSBURGH, PA.
PINIONS, CHILLED & SAND ROLLS.
ROCK CRUSHERS
ROLLING MILL & TIN PLATE MILL MACHINERY

**THE LORAIN FOUNDRY COMPANY,**

Lorain, Ohio.

**SAND AND CHILLED ROLLS.**

Heavy Iron Castings in Loam, Dry and Green Sand, Made from Cupola or Air Furnace...

**BRASS AND COPPER CASTINGS.**

"Metallurgy of Cast Iron," (Second Edition.)

By THOS. D. WEST; 107 engravings, 583 pages. Just issued. A valuable work to Founder, Molder, Draughtsman, Designer, Technical School Specialist. Chemistry of Iron; cheapening of mixtures; the effect of the metalloids in changing the grade of iron; latest improvements in cupola construction and practice—all are fully covered. Price $3. Sent postpaid on receipt of price, by *The Iron Trade Review Co.*, Cleveland, Ohio; 1522 Monadnock Block, Chicago, Ill.

James M. Swank, author of "Iron in All Ages," and editor of the *Bulletin* of TheAmerican Iron and Steel Association, in reviewing "Metallurgy of Cast Iron," says it is "One of the most valuable publications relating to the manufacture of iron castings, that has ever, to our knowledge, been issued in this or any other country."

# IRON and STEEL CONSOLIDATIONS.

Complete, Authorized List Now Ready.

## Second Edition of Supplement to the DIRECTORY OF THE IRON AND STEEL WORKS OF THE UNITED STATES FOR 1898.

From the circular of the Association, issued under date of Sept. 15 we take the following:

"In March last we presented to the American Iron Trade a descriptive list of the consolidations of iron and steel companies which had taken place in the United States since January 1, 1898, twenty-three in all. We now present to the trade a more complete list of iron and steel consolidations, embracing those organized since March as well as those previously described, *numbering thirty in all*, the information relating to each consolidated company being revised and verified down to August 15. We have confined the list of consolidations to those which embrace the ownership of blast furnaces, rolling mills, steel works, tinplate works, and auxiliary industries, including shipbuilding and bridgebuilding works. Only companies that have been consolidated since January 1, 1898, are described in this volume, which is a Supplement to the last edition of our Directory to the Iron and Steel Works of the United States. *A new edition of the Directory cannot be printed this year.*

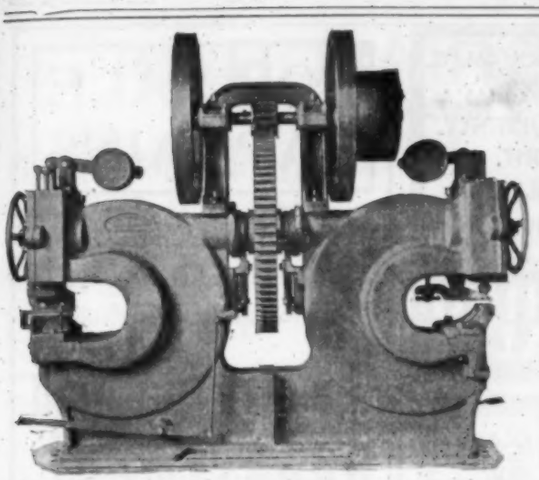
"The present edition of the Supplement comprises 78 well printed pages and contains an authorized description of the organization of each of the thirty consolidations mentioned, giving its capitalization, list of officers, general office address and address in most instances of the district offices, and a list of properties owned or operated by it, with the names of previous owners of iron and steel works. The name and the character of every plant are fully stated. For detailed information concerning the plants mentioned and their products reference is given to the page or pages in the Directory in which they are fully described. Iron ore mines, coal mines, coke ovens, railroads, and lake vessels owned by the consolidated companies are also given in sufficient detail."

Price - - $2.00

Sent Postpaid by

**The Iron Trade Review Co.,**

CAXTON BUILDING, CLEVELAND, O.



This cut illustrates our double punch and shear, one end being equipped with our regular punching attachment, the other end arranged as a shear either for cutting off bars or splitting plate, as desired. This double end machine is in all respects up to the standard of our regular single machines, and is a very handy tool in any shop where considerable punching and shearing is done.

Let us have your inquiry for price on one of these machines.

**The Cleveland Punch and Shear Works Co.**
**CLEVELAND, OHIO, U. S. A.**

# DIRECTORY

## To the Iron and Steel Works of the United States for 1898.

PUBLISHED BY
THE AMERICAN IRON AND STEEL ASSOCIATION.

**Thoroughly Revised. Price, Seven Dollars**

The lists of Plate and Sheet Mills and of Tin Plate and Stamping Works are much more complete than in previous editions. The names and location of all the works described are given in alphabetical order, followed by a description of their character, capacity and products, with the names of the principal officers, etc., including the names of selling agents. This edition makes a cloth-bound book of nearly 400 well-printed pages—many more than in any previous edition It contains a complete list of all the

Blast Furnaces,
Rolling Mills,
Bessemer Steel Works,
Open-Hearth Steel Works,
Crucible Steel Works,
Plate and Sheet Mills,
Rail Mills,
Structural Mills,
Steel Casting Works,
Cut-Nail Works,
Tin Plate Works,
Stamping Works,
Forges and Bloomaries,
Wire Rod and Wire Mills,
Wire Nail Works,
Iron and Steel Bridge Builders,
Iron and Steel Ship Builders,
Horse-Nail Works,
Locomotive Works,
Malleable Iron Works,
Cast Iron Pipe Works,
Cast Iron Soil and Plumbers' Pipe Works,
Wrought Iron, Wrought Steel and Riveted Pipe Works,
Seamless Tube Works,
Chain Works,
Bolt, Nut and Rivet Works,
Car Axle Works,
Car Wheel Works, and
Car Builders in the United States.

ALSO A LIST OF THE

**Iron and Steel Works in Canada and Mexico.**

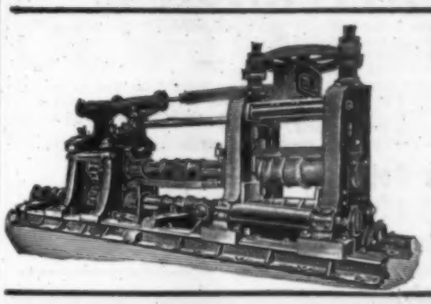
This edition of the Directory is an invaluable book of reference for all business men who wish to correspond with iron and steel manufacturers or with iron and steel consumers, forming, in every respect, a COMPLETE GUIDE to the iron and steel works of this country and to the principal works which consume iron and steel.

Sent postpaid, on receipt of price, by

**THE IRON TRADE REVIEW CO.,**
PITTSBURG, CLEVELAND, CHICAGO.

**WEST PENN FOUNDRY & MACHINE CO.,**
AVONMORE, PA.

Manufacturers of
TIN, SHEET AND BAR MILL PLANTS.
Blast furnace work. Steel work. Hydraulic machinery. General castings of every description.



**Frank-Kneeland Machine Co.,**
54th St., PITTSBURG, PA.
CHILLED, SAND AND STEEL **Rolls.**
ROLLING MILL MACHINERY.

**Canton Roll & Machine Company, Canton, Ohio.**
MANUFACTURERS OF
**Chilled, Sand and Semi-Steel Rolls.**
Rolling Mill and Tin Plate Machinery.
HEAVY CASTINGS OF EVERY DESCRIPTION.
ESTIMATES FURNISHED FOR COMPLETE PLANTS.

**IRON CLAD PAINT CO.**
535 TO 541 SENECA ST., CLEVELAND, O.

NO. 1 ROBBIE RED.
NO. 2 LIGHT BROWN.
NO. 3 BROWN PURPLE.
NO. 4 BROWN.

**Iron Clad Paint**
is the
**Most Durable, Most Fire-proof and Cheapest paint made.**
Furnished both Dry and Ground in Oil.
Used by nearly all the Railroads.

**The Iron Trade Review**
Pays special attention to iron ore, blast furnace rolling mill, foundry and machine shop interests
Per year **$3.00.**

**FOUNDRY COKE**

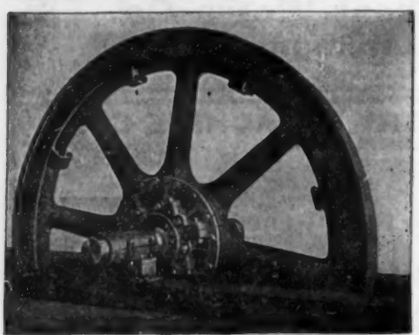
*Agents.*
PINNICKINNICK COAL CO.
GENERAL HOCKING FUEL CO.
CONNELLSVILLE.
STONEGA.
POCAHONTAS.
72 HOUR FOUNDRY COKE.

**O'GARA, KING & CO.**

WESTERN UNION BLDG.
CHICAGO.

STANDARD BLOCK COAL CO.
····MINES IN No.8·····
PITTSBURG DISTRICT.
PIEDMONT.
CUMBERLAND.
BLOSSBURG.

**SMITHING COAL**



60,000 lb. Built Up Fly Wheel.

**The Dodge Mfg. Co.,**
MISHAWAKA, IND.
Engineers. Founders. Machinists.
BRANCHES: Boston, New York, Cincinnati, Chicago, Atlanta, London, Eng.
CONTRACTS FOR HEAVY
**Band and Fly Wheels, Rope Sheaves, Rolling Mill Power Equipments.**
RESPECTFULLY SOLICITED.
Deliveries prompt. Prices upon application.

**PATTERNS** For Castings

Have you a machine for joining segments? Have you automatic lathes? An automatic gear-cutter? Flexible shaft machines for finishing fillets and for outside rounds? Do you use sand papering machines.
The above special tools cannot be bought in the market, as can a bandsaw. We designed them for our own convenience. We have the best equipped and the largest pattern shop in the world.
We can save you big money in the course of a year.

**The Gobeille Pattern Company,**
CLEVELAND, OHIO.

**WOOD PATTERNS FOR CASTINGS.**
**THE BALKWILL PATTERN WORKS,**
970-972 Hamilton St., CLEVELAND, OHIO.

We do not use automatic lathes.
We can furnish you with patterns as promptly as any other concern.
Our facilities for doing business are equal to any other concern.
Our prices are lower.

**FORSYTH PATTERN WORKS.** YOUNGSTOWN, OHIO.
MACHINE AND ARCHITECTURAL PATTERNS OF ALL DESCRIPTIONS.
GEAR WORK A SPECIALTY.
Patterns for Castings from ¼ pound to 50 tons. Send on your Drawings and get prices.

When you want accurate castings, have your wood and metal **PATTERNS**
made by the MT. VERNON PATTERN & MODEL WORKS, 400-404 N. Vine St., Mt. Vernon, Ohio.
A No. 1 Work Our Specialty.

**Subscribe for THE IRON TRADE REVIEW**

**FOR SALE BARGAINS**

are quickly "snapped up" when placed before the buying public through our

**Special Bargain Department.**

Short time rates on application to the business department

SMALL INVESTMENTS BRING LARGE RETURNS.

**DO YOU WANT ANYTHING?**

Our Want Department is at your disposal. Results are bound to satisfy you. Try it.

THE
**Iron Trade Review Co.,**
Caxton Bldg., CLEVELAND, O.

# C. R. BAIRD & COMPANY,

372 BULLITT BUILDING, PHILADELPHIA.

BASIC, BESSEMER, FOUNDRY AND FORGE PIG IRON.

BAR IRON AND WROUGHT PIPE.

BASIC OPEN-HEARTH STEEL.

---

**Oglebay, Norton & Co.,**
LAKE SUPERIOR IRON ORES.
—AGENTS—
The Spanish-American Iron Co.,
Santiago, Cuba.
CLEVELAND. PHILADELPHIA.

---

**Pickands, Mather & Co.,**

IRON ORE,
PIG IRON AND
COAL - - - -

CLEVELAND, OHIO.

---

**McKEEFREY & CO.,**

PIG IRON,
COAL AND COKE.

LEETONIA, OHIO.

---

**M. A. HANNA & CO.**

IRON ORE,
PIG IRON AND COAL.

CLEVELAND, OHIO.

---

**Drake, Bartow & Co.**

**IRON ORES.**

515-516 Perry-Payne Building,
CLEVELAND.

---

**Inspected Foundry Iron**

That's strong—that's fluid—that's uniform—that's soft.

CLINTON
HECTOR

Originated and made only by us. Write or wire for prices.

**CLINTON IRON & STEEL CO.**

FURNACES AND GENERAL OFFICES, PITTSBURG, PA.
NEW YORK OFFICES, 31 CORTLAND STREET.

---

**Alabama Consolidated Coal & Iron Co.,**
BIRMINGHAM, ALA.
Manufacturers of the Celebrated Brands of Foundry Iron:

**CLIFTON AND ETOWAH**

This iron is specially adapted to thin, strong castings.

Also Miners and Shippers of HIGH GRADE STEAM COAL.

And Makers of the Well-known "STANDARD" FOUNDRY COKE.

Selling Agents for the North and West:

MATTHEW ADDY & CO., Cincinnati, Chicago, St. Louis, Pittsburg, Philadelphia, New York.
MOBILE COAL CO., Agents for Coal and Coke in Mobile territory.

---

LAKE SUPERIOR CONSOLIDATED IRON MINES.

**HIGH GRADE MISSABE ORES.**

Adams, Ainslie, Duluth, Hibbing, Hartley, Linwood and Pillsbury Mines.

OGLEBAY, NORTON & CO., Sales Agents, Cleveland, Ohio.

---

**GABEEN & CO.,**
Real Estate Trust Building, PHILADELPHIA.
*Steel Billets and Slabs, both Bessemer and Open Hearth, Pig Iron, Manufactured Steel, &c.*

---

SUBSCRIBE FOR THE IRON TRADE REVIEW.

---

**Tod, Stambaugh & Co.,**
LAKE SUPERIOR IRON ORES.
206 Perry-Payne Building,
CLEVELAND, O.

---

**PICKANDS, BROWN & CO.,**
**PIG IRON, IRON ORE and FRICK COKE.**
CHICAGO.

---

**PIG IRON.**
RED RIVER IRON CO'S HIGH SILICON PIG
Hickman Williams & CO.
Exclusive Agents,
The Rookery, CHICAGO. Tel. Harrison 1113.
American Nat'l Bank Bld'g LOUISVILLE.

---

**J. Wesley Pullman,**
238 South Third Street, PHILADELPHIA.
Best American and Foreign **IRON ORES**
Neutral Pig Irons.

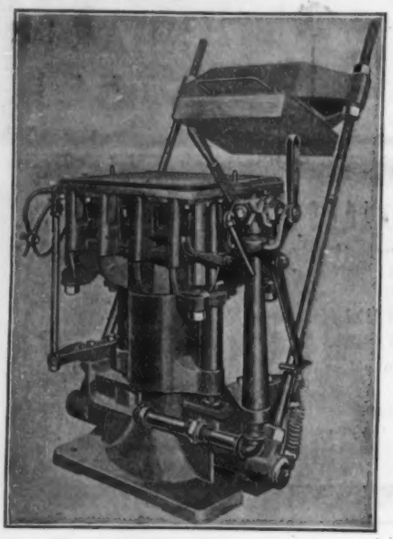
**STANDARD CHAIN CO.,**

General Offices: First National Bank Bldg., PITTSBURGH, PA.

MANUFACTURERS

**CHAIN OF ALL KINDS.**

Chain for Foundry and Machine Shop work a specialty. All sizes of B. B., B. B. B., and High Grade Chain. Certificate of test furnished. Railroad chain of all descriptions. Ships' Cables, Stud Link, and Marine Railway Chain, Dredge Chain, etc.



**Molding Machines**

Lowest Possible Pattern Cost.

SUITED TO ALL CONDITIONS.

1. Gated Work, no Change in Patterns.
2. Vibrator Machines, no Stripping Plates.

**THE TABOR MFG. CO.,**

18th & Hamilton Sts., PHILADELPHIA, PA.

**JEFFREY ELEVATING CONVEYING MACHINERY**

Century Rubber Belt Conveyor.

Complete Line of COAL MINING MACHINES. Electric Mine Locomotives, Power Coal Drills, Motors, etc., etc.

SEND FOR CATALOGUE.

Address: The Jeffrey Mfg. Co., Columbus, Ohio, U.S.A.

New York. Denver.

Best material obtainable. Highest standard attainable. A third of a century of successful experience.

Seven works in two states on three competing trunk lines. One quarter of a million daily capacity.

**REESE-HAMMOND FIRE BRICK CO.,**

PITTSBURG OFFICE: 913-914 Park Building.

GENERAL OFFICE: Bolivar, Pa.

**High Grade Fire Brick**

FOR ALL PURPOSES.

Special Attention given to the Furnace and Foundry and Coke Trade.

**Hand Made Fire Brick** For Boiler Setting, Puddling Furnaces, etc.

Ground and Screened Fire Clay.

THE KEYSTONE FIRE CLAY CO., Lisbon, Ohio.

**In the Pay Envelope**

*That's where our education affects you.*

*We teach mechanics the theory of their work; help misplaced people to change their work; enable young people to support themselves while learning a profession.*

250,000 students and graduates in Mechanical, Electrical, Steam and Civil Engineering, Architecture, Telegraphy, Stenography, Book-keeping, etc. Write for circular and mention subject in which interested.

INTERNATIONAL CORRESPONDENCE SCHOOLS, Established 1891. Capital $1,500,000. Box 1018 Scranton, Pa.

**FIRE BRICK**

**F. B. HOLMES & CO., Detroit, Mich.**

Manufacturers and Shippers

Steel, Savage Mountain, Holmes

**FIRE BRICK.**

Best made for Malleable, Rolling Mill Furnaces and Cupola Linings.

**THE "CLEARFIELD" FIRE BRICK**

MANUFACTURED BY

The Clearfield Fire Brick Co., Limited,

Office and Works at CLEARFIELD PA.

Room 418 Ferguson Bldg., PITTSBURG, PA., John Richardson, Agent.

**...A B C OF IRON...**

A book for foundrymen. It is issued in cloth binding, and gives much valuable matter on how to reduce cost of mixtures, and on grading and numbering of pig iron.

CHAPTER HEADINGS:—Iron—What is it? Pig Iron. Constituents of Iron. Numbering of Pig Iron. Grading of Iron. How to reduce cost of mixture. Steel, Physical Properties of Metals Defined. Statistics. Early History and Manufacture of Iron.

Former Price, $2.00. NOW $1.00.

Sent, postpaid, on receipt of price, by

THE IRON TRADE REVIEW CO.,

CHICAGO. CLEVELAND PITTSBURG

**MOULDING SAND**

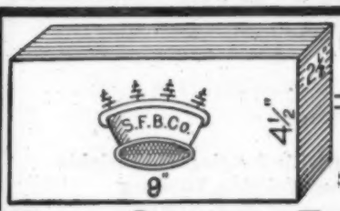
JOHN H. EHLEN, Newport, Ky.

Have several banks of the very best grades of the famous Newport Sand. All grades medium and fine brass work a specialty. Good shipping facilities. Samples and Prices on application.

When writing to advertisers please mention The Iron Trade Review.

SCOTT DIBERT, PRES. HENRY Y. HAWS, GEN. MGR.
T. C. DU PONT, VICE-PRES JOHN H. WATERS, SEC'Y-TREAS
INCORPORATED 1899.
W. H. HAWS FIRE BRICK CO.,
ANNUAL CAPACITY 15,000,000
MFRS. OF HIGH GRADE SILICA BRICK.
Special Shapes Made to Order.
Pittsburg Agent, W. H. HILL, 404 Park Bldg. Office and Works, MT. UNION, Huntingdon Co., Pa.

THE WEBSTER FOUNDRY SAND CO.,
INCORPORATED
PULVERIZED FIRE CLAY A SPECIALTY
ALBANY SAND
CEMENT SAND
BUILDING SAND
MILLVILLE CORE
GRAVEL
Genuine Lamberton SANDS
BRASS SAND
ASPHALT SAND
FIRE CLAYS
JERSEY GRAVELS
SILICA SAND
PLANTS:
Borton's Landing Rancocas River New Jersey.
Florence, Delaware River, New Jersey.
Maurice River, New Jersey.
961 North Delaware Ave.
PIER 41,
PHILADELPHIA.



Established 1864
CAPITAL STOCK $100,000.00

THE SCIOTO FIRE BRICK COMPANY,
SCIOTOVILLE, OHIO.
MANUFACTURERS OF
HIGH GRADE FIRE BRICK.

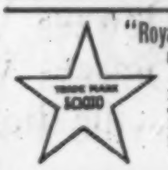
BRASS FOUNDERS' SUPPLY CO.,
Newark, N. J.
ELECTROMAGNETIC SEPARATOR
takes IRON and STEEL from BRASS Turnings, Borings, Filings, Emery, etc.
SELF-FEED AND REQUIRES LITTLE TIME TO REFILL THE HOPPER.
The ELECTROMAGNETS do not weaken with use, and can be made weak or strong at the will of the operator.
SEND FOR PAMPHLET WITH FULL DESCRIPTION.

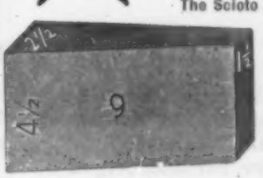
FIRE BRICK
DOVER FIRE BRICK CO.,
MANUFACTURERS OF
Furnace, Mill & Special Shape Fire Brick.
Office, 508-509 Cuyahoga Bldg.,
CLEVELAND, O.

FIRE BRICK for all purposes
CHICAGO FIRE BRICK CO.,
518 Chamber of Commerce, CHICAGO, ILL.

High Grade FIRE BRICK
The Crown Fire Clay Company,
AKRON, OHIO.
76 Kilns, 75,000 Daily Output. 911 Chamber of Commerce, CHICAGO.

Fire Brick
CUPOLA BLOCKS
MOULDING SAND
AND GENERAL
FOUNDRY SUPPLIES
OF THE HIGHEST GRADE ONLY
The Garden City Sand Co
1201-1202-1203 Security Bldg CHICAGO



"Royal Star" and "Scioto Star"
High Grade FIRE BRICK.
Best for Rolling Mills, Blast Furnaces, Foundries, etc. High grade Plastic and Flint Clays for all refractory purposes at favorable prices.


The Scioto STAR Fire Brick Works,
PORTSMOUTH, OHIO.
Send for Catalogue.
Established 1871.
Incorporated 1876.

Established 1856.
A. J. HAWS & SONS, Ltd.,
Office and Works, JOHNSTOWN, PA.
Manufacturers of the
HAWS SILICA BRICK.
Capacity 27,000,000 per annum.
Tuyeres and Brick Converter Bottoms for Bessemer Steel Works; also Ladle Nozzles, Stopper Rod Sleeves, Runner Brick for Bottom Casts, Blast Furnace Linings, Ground Fire Clay, and all kinds of Fire Brick.

A. F. SMITH & CO.,
MANUFACTURERS OF
Fire Brick and Clay,
BEAVER COUNTY SAND STONE.
Telephone 42. NEW BRIGHTON, PA.

## The Iron Founder

A comprehensive treatise on the art of molding, including chapters on core making, loam, dry sand and green sand molding, also crystallization, shrinkage and contraction of cast iron and a full explanation to the science of pressures in molds, added to which are formulas for mixtures of iron, tables, rules and miscellaneous information. By SIMPSON BOLLAND. Illustrated with over 300 engravings. 12mo.; cloth ..... $2.50

Sent, postpaid, on receipt of price, by
The Iron Trade Review Co.,
Caxton Bldg. - CLEVELAND OHIO.

The A B C of Iron,
NOW $1.00.

# American Sheet Steel Company

Battery Park Building New York

Manufacturers of all varieties of

## IRON AND STEEL SHEETS

Black and Galvanized
Plain and Painted
Flat, Corrugated and "V" Crimped

Apollo Best Bloom Galvanized Sheets
W. Dewees Wood Company's Planished Iron.
W. Dewees Wood Company's Refined Iron.
Wellsville Polished Steel Sheets

DISTRICT SALES AGENTS

STOCKTON & BRAINARD, Marquette Building, Chicago
W. J. WETSTEIN & JOHN W. GOOD, Security Building, St. Louis
S. J. WATERMAN, Neave Building, Cincinnati
HOGE & SWIFT, Portland, Oregon
T. H. SPEDDY, San Francisco
F. A. GOODRICH & COMPANY, Chamber of Commerce, Detroit
T. W. SIMPERS, Land Title Building, Philadelphia
F. C. MILLIKEN, Times Building, Pittsburg
S. L. MITCHEL, Hennen Building, New Orleans
W. T. SHANNON, 34 West Ninth Street, Chattanooga
LEE CHAMBERLAIN, Los Angeles
L. A. HASTINGS, 1622 Arapahoe Street, Denver
B. & S. H. THOMPSON & COMPANY, Montreal, Canada

# American Bridge Co.

DESIGNERS AND BUILDERS OF

## STEEL BRIDGES, STEEL BUILDINGS

AND ALL CLASSES OF

## METALLIC STRUCTURES.

GENERAL OFFICES: 100 BROADWAY, NEW YORK.

BRANCH OFFICES:

Albany, N. Y.
Athens, Pa.
Boston, Mass.
Buffalo, N. Y.
Baltimore, Md.
Butte, Mont.
Columbus, O.
Chicago, Ill.
Canton, O.
Cleveland, O.
Denver, Colo.
Duluth, Minn.
East Berlin, Conn.
Elmira, N. Y.
Groton, N. Y.
Horseheads, N. Y.
Lafayette, Ind.
Milwaukee, Wis.
Youngstown, O.
Minneapolis, Minn.
New Orleans, La.
Pencoyd, Pa.
Philadelphia, Pa.
Pittsburg, Pa.
Rochester, N. Y.
London, Eng.
Seattle, Wash.
San Francisco, Cal.
Salt Lake City, Utah.
Sydney, N. S. W.
Trenton, N. J.
Wilmington, Del.

# Sloss Sheffield Steel and Iron Company, Sloss Iron and Steel Company,

BIRMINGHAM, ALABAMA.

MANUFACTURING FOLLOWING WELL KNOWN BRANDS OF FOUNDRY IRON:

"SLOSS" "FLORENCE" "SHEFFIELD" "LADY ENSLEY."

SHIPPERS OF

FOUNDRY COKE FROM WASHED COAL, **SLOSS PRATT STEAM** AND BLOCK DOMESTIC COAL.

Cable Address SLOSS, BIRMINGHAM using Lieber's, A-1, Watkins, Western Union Telegraphic and Atlantic Cable Directory Codes.

SELLING AGENTS:

Hugh W. Adams & Company, 15 Beekman Street, New York City.
Hugh W. Adams & Company, 85 Water Street, Boston, Mass.
D. L. Cobb, 1439 Monadnock Block, Chicago, Ill.
D. L. Cobb, 305 Security Bldg., St. Louis, Mo.
J. K. Dimmick & Company, 911 Drexel Bldg., Philadelphia, Pa.
Stevenson, Field & Company, 45-46 Board of Trade, Columbus, O.
C. L. Baum, Salt Lake City, Utah.
J. R. Lehmer, 1212 Farnam Street, Omaha, Neb.
Martin Pipe & Foundry Company, San Francisco, Calif.
Hasam & Moreno, la Calle de las Damas 5, City of Mexico.

# Tennessee Coal, Iron & Railroad Company,

General Offices, BIRMINGHAM, ALA.

MAKERS

Basic Open Hearth Steel.
Blooms, Billets and Slabs.
Foundry, Forge and Basic Pig Iron.
Merchant Bar-Iron and Steel.
Steel Castings.
Spiegeleisen & Ferro Manganese.

MINERS AND SHIPPERS

Coal, Coke, Ore, Limestone and Dolomite.

Export Facilities through Ports of New Orleans, Mobile, Pensacola, Charleston, Port Royal, Brunswick, Savannah and Norfolk.

**"The Alpha and Omega of the pressed steel car," writes the General Superintendent of a great American railroad, "is that it admits of a maximum of revenue-bearing tonnage being hauled with a minimum of dead weight." . . . THAT IS WHAT IT IS BUILT FOR.**

**PRESSED STEEL CAR COMPANY.**

**PITTSBURGH. NEW YORK. CHICAGO. PHILADELPHIA. JOLIET.**

# STEEL FORGINGS. Frankford Steel & Forging Co.,

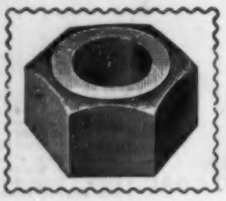
PHILADELPHIA. PA.

Chicago Office: 1020-1021 Monadnock Building, Frederick H. Mason, Manager.

**THE MILTON MANUFACTURING CO.,**

**Milton, Pa.**

MANUFACTURERS OF



**COLD PUNCHED NUTS**

Hot Pressed Nuts, Plate Washers, etc.

Quality and Finish the Best. Send Specifications for Prices.

# National Steel Company

BATTERY PARK BUILDING, NEW YORK

MANUFACTURERS OF **Rails**

Bessemer and Open-Hearth Billets

LONDON OFFICE:
77-78 Gracechurch Street,
LONDON

Sheet and Tin Plate Bars.

# NATIONAL TUBE COMPANY,

Manufacturers of

**BLACK and GALVANIZED**
Wrought Merchant Pipe, all kinds: sizes 1-8-inch to 30-inch, fitted in any manner desired.

**BOILER TUBES,**
Mild Steel and Charcoal Iron, for Stationary, Locomotive and Marine Work.

**CASING, TUBING**
and Drive Pipe for Well Purposes.

**GAS AND OIL LINE PIPE.**

**CYLINDERS,**
Lap-Welded and Seamless, tested from 100 to 3,700 lbs., for Compressed Air, Carbonic Acid Gas, Anhydrous Ammonia, etc., etc., etc.

**WATER and GAS MAINS,**
Converse and Matheson Lead Joint Pipe, 2-inch to 30-inch.

**SEAMLESS**
Tubes, Shrapnel, Projectiles and Miscellaneous Forgings.

Office of
President and Treasurer,
Havemeyer Bldg., NEW YORK CITY.

Office of
Mercantile and Manufacturing Departments,
Conestoga Bldg., PITTSBURG, PA.

**LOCAL SALES OFFICES:**

Havemeyer Building, NEW YORK CITY. 70 Federal St., BOSTON.
267 S. 4th St., PHILADELPHIA.
Conestoga Bldg., PITTSBURG. Western Union Building, CHICAGO.

Foreign Office: Dock House, Billiter Street, LONDON. Telegraphic Address: TUBULIFORM, LONDON.

# American Steel & Wire Co

NEW YORK, Empire Building. CHICAGO, The Rookery. SAN FRANCISCO, 8 and 10 Pine St. DENVER, 809 17th St.

STEEL PLATES AND SHEETS.

BAR STEEL—All Shapes.

BEAMS, CHANNELS, ANGLES.

COLD-DRAWN STEEL SHAPES

WRITE FOR PRICES.

# SPRINGS

EXTENSION—COMPRESSION—TORSION.

Coiled, Spiral and Flat Springs for every purpose, made from our own special steels in accordance with specifications.

## Round or Flat Springs to Order

to meet all requirements.

Write for prices to

## American Steel & Wire Co.

# American Steel Hoop Company,

General Offices: Battery Park Bldg., NEW YORK CITY.

MANUFACTURERS

Steel Hoops — Special Shapes
Steel Bands — Angles
Cotton Ties — Channels
Steel Bars — Small Tee Rails
Bar Iron — Pig Iron — Open Hearth Steel

DISTRICT SALES OFFICES:

New York, Battery Park Bldg
Chicago, Marquette Building
St. Paul, Endicott Building
Cleveland, 1405-1406 Williamson Blk
St. Louis, Fullerton Building
San Francisco, 23 Davis Street
Philadelphia, Land Title Building
Cincinnati, Chamber of Commerce Bldg
Boston, 8 Oliver Street

# THE SUMMIT WIRE CO

CUYAHOGA FALLS, OHIO.

All kinds of special

# Wire

SPOOLED, IN THE COIL, OR STRAIGHTENED AND CUT TO EXACT LENGTHS.

WIRE NAILS AND BRADS, STEEL RIVETS.

Quality and Prompt Shipments our Specialties

Molder's Text Book, Price $2.50

# Tropenas Department

...SMALL...

# Steel Castings

TO REPLACE DROP FORGINGS.

Accurate Work. Prompt Delivery.

# THE SARGENT CO.,

887 Old Colony Bldg., CHICAGO.

ROBT. L. HENRY, Prest. THEO. D. MORGAN, Gen. Mgr. WALTER E. STOY, Secy. and Treas.

# Champion Iron & Steel Co.,

## MUSKEGON, MICH.

MANUFACTURERS OF

# TIN PLATE, TERNE PLATE, BLACK PLATE AND SHEETS

Four mills now running. Four more mills building. This Company has its own Open-Hearth Steel Plant and Bar Mill.

Also manufacturers of **MERCHANT BARS, STEEL AND IRON.** Your inquiries solicited.

# The Iron Trade Review

Pays special attention iron ore, blast furnaces rolling mill, foundry and machine shop interests. Per year **$3.00.**

**Republic Iron & Steel Co.,**
CHICAGO, ILL.

DISTRICT SALES OFFICES:
New York,
Cleveland,
Birmingham,
Buffalo,
Cincinnati,
St. Paul,
San Francisco,
St. Louis,
Butte, Mont.

**BAR IRON**
**BAR STEEL**

Machine Bolts,
Carriage Bolts,
Gimlet Point
Coach Screws.
Turnbuckles.

NUTS. R. R. SPIKES. PIG IRON.

THE
**LORAIN STEEL COMPANY,**
Lorain, Ohio.
Rails, Blooms, Billets and Slabs.

**American Tin Plate Company**

MANUFACTURERS OF

Coke Tin Plates,
Charcoal Tin Plates,
High Grade Terne Plates,
Black Plates.

GENERAL OFFICES:
Battery Park Building,
NEW YORK CITY, N. Y.

# FOR SALE

Ludgerwood Cableway, 1000 feet span, Boiler, 3 drum Engine, etc.
Fifteen Hoisting and Haulage Engines.
¼ Yard Little Giant Traction Shovel.
27 1¼ Yard Dump Cars.

**CARLIN MACH. & SUPPLY CO.,**
JOHN H. CARLIN, PROP.
101-107 Lacock Street,
ALLEGHENY, PA.

**MACHINERY**
**Second-Hand—First-Class Order**

50-lb. Power Hammer (Dinelt & Eisenhardt.)
5-lb. Bradley Helve Hammer.
80-lb. Pratt & Whitney board lift, automatic Drop Hammer.
76-lb. Poppett Drop Hammer.
98-lb. Drop Hammer with 2 poppetts.
123-lb. Drop Hammer with 4 poppetts.
224-lb. Drop Hammer.
No. 7 Jarecki Pipe Machine, capacity ⅛ to 2 in.
4 to 6 in. Curtis Pipe Machine for hand and power.
Single Spindle Garvin Profiler.
14-in. Brown & Sharp Screw Machine, friction geared head, without wire feed.
No. 6 Davis & Egan Screw Machine, friction geared head, chard turret.
No. 2 Reed Plain Milling Machine, back geared.
No. 3 Garvin Hand Miller.
No. 1 Cincinnati Full Universal Milling Machine.
No. 3 Plain Cincinnati Milling Machine with all power feeds.
16x16x4 ft Planer (Hendy.)
30-in. by 18 ft. centers New Haven Lathe.
9-in. Star Screw Cutting Lathe, foot power.
22½-in. Drill, power feed, back geared (Barnes.)
10 in. D'Amer & Littledale sensitive drill on columns.
No. 1 Davis Key Seater, and 80 light Dynamo, with rheostat and volt meter.
30x30x8 ft. Whitcomb planer.
38x38x8 ft. Cove " "
36x36x12 ft. Wilson " with two heads.
18 in. Prentice drill with chuck.
20 in Snyder drill, power feed, back gear.
P—4 Ferracute back-geared press.
Write us for any machinery wanted, also if you wish to sell or exchange.
Woodward & Rogers Horizontal Tapping Machine.
No. 2 Garvin Horizontal Tapping Machine.
24-in.x20-ft. bed, compound rest, New Haven Lathe.
16-in. Lodge & Davis crank shaper.
28-in. New Haven Drill, B. G. & P. F.
2-in. Saunders Pipe Machine.
No. 5 combined punch and shear, Long & Allstatter.
20x42 Hamilton Corliss Engine, right hand.
20x42 Hamilton Corliss Engine left hand.
18x42 Allis Corliss Engine, right hand, can be changed to left.
6 in. Boynton & Plummer shaper.

C. C. WORMER MACHINERY CO.,
20 to 36 Shelby St., Detroit, Mich.

# ELECTRICITY FOR ...FACTORY DRIVE...

**DYNAMOS.**
Motors. Lamps. Supplies.
**ENGINES.**
Corliss. Automatic. Plain.
**BOILERS. PUMPS. HEATERS.**

**THE PELTON ENGINEERING CO.**
ENGINEERS, CONTRACTORS, DEALERS.
CLEVELAND, - - OHIO.

**FOR SALE. Steam Shovels.**

1 Victor 70 tons 2½ yard dipper. Engines on Crane. Just completely rebuilt.
1 Bucyrus 70 tons 2½ yard dipper. Engines on Boom. First class condition.

**Torbert & Peckham,**
1605 Monadnock, CHICAGO.

# FOR IMMEDIATE DELIVERY.

**ANGLES, BEAMS, CHANNELS, PLATES, TEES, ZEES, BARS.**
Cut to specified sizes.

5,000 tons in stock. Moderate prices. Send for stock sheet and quotations.

Structural Department
**ILLINOIS STEEL CO.,**
Designers, Manufacturers and Erectors of Structural Iron Work. Dealers in Structural Material.
50 Wabansia Ave., CHICAGO

# FOR SALE.
# Second Hand Tools.

Three "Bryant" Cold Saws.
One "Whitcomb" Planer 37 in. x 36 in. x 9 ft.
One "Cockburn" Concrete Mixer.
One "Sturtevant" Blower No. 8.
One " " No. 5.
Two horizontal tubular boilers, 66 in. x 16 ft., with 90 three inch tubes, now running under 80 "pounds pressure."

ALSO
NEW CORNELL BLOWERS—Poole's patent, all sizes—the best in the market—send for prices.

**J. B. & J. M. Cornell,**
26th Street., & 11th Avenue, NEW YORK CITY.

# FOR SALE.

The property of the Michigan Land and Iron Co., Lim., in Upper Peninsula of Michigan. Mines, mineral rights and timber for sale. For particulars, address
THE MICHIGAN LAND & IRON CO., Lim.,
MARQUETTE, MICH.

WANTED
# SCRAP STEEL.

Give description, shipping point and lowest spot cash price.
P. GREINER, 406 Drexel Building, PHILADELPHIA, PA.

# WANTED

A young man of business experience and ability wishes to purchase an interest in a reliable and paying concern, in or near Cleveland, where his services will be required.
BOX 66,
care IRON TRADE REVIEW, Cleveland, O.

**Harrisburg, Pa.**
**An Ideal Shipping Point**

Have you ever experienced the need of a central distributing point for the eastern field? Many manufacturers now carry stocks of goods here. The best located man often gets the trade. You can RENT Large, Centrally Located Warehouses with attendants, of us, or you can BUY our former plant (we now occupy our new factory), well located for manufacturing or warehouse purposes.
HARRISBURG FOUNDRY AND MACHINE WORKS

The STANDARD BOILER for utilizing Waste Heat in connection with any kind of Rolling Mill Furnace is

# The Hyde Water Tube Boiler.

Write for particulars to,
**HYDE BROS. & CO**
Pittsburg, Pa.

**BEAMS, CHANNELS, ANGLES, ZEES, PLATES.**
2000 Tons in Stock.

Eye Beams, 4 inch to 20 inch, inclusive.
Channels, 4 inch to 15 inch, "
Equal Angles, 1¼ x 1¼ to 6 x 6, "
Unequal " 2½ x 2 to 6 x 4, "
Plates, ¼ inch thick and over.
Zees, 3 in., 4 in., 5 in. and 6 in.

All material in 50 to 70 ft. lengths or cut to specified lengths when desired. Shipments promptly on receipt of order. Send for detail stock list.

**THE FOREST CITY STEEL & IRON CO.,**
Cleveland O.

# FOR SALE.

300 60,000 lb. capacity Hopper bottom gondola cars.
Lot of large mine pumps for heavy service.

**Torbert & Peckham,**
1605 Monadnock, CHICAGO.

**FOR SALE. Immediate Delivery.**

12 lathes 9 to 48 in. swing, 2 shapers, bolt cutter, 3 blowers, 36x36x12 ft. planer, wood lathe, band saw, 10 drill presses, 8 h. p. gas engine, 9 engines, 8 boilers, 6 tanks, 6 incandescent arc lights, 1 Gisholt lathe, ½ doz. grindstones. Supplies of all kinds.
THE ATLAS MACHINE CO.,
26th & Liberty Sts. PITTSBURG, PA.

**A Lot of Miscellaneous Material we will dispose of at a Reasonable Price.**

2 Wetherill Heaters 750 H. P. each. Brass tubes
1 " " 750 H. P. each. Iron "
1 Locomotive Boiler 100 H. P. Complete with fittings and stack.
1 Locomotive Boiler 40 H. P. Complete with fittings and stack.
2 Horizontal Tubular Boilers 80 H. P. Complete with fittings, fronts and stacks.
2 Horizontal Tubular Boilers 100 H. P. Complete with fittings, fronts and stacks.
1 Sturtevant Fan, No. 9.
2 Grinding Pans.
1 Locomotive. 42-in. gauge, good condition.
Lot of wire, rope, shafting, pulleys, hangers.
Second hand pipe, all sizes.

**WICKES BROS.,**
45th & A. V. R. R. PITTSBURG, PA.
Telephone Fisk 243.

# FOR SALE.
**NEW AND RELAYING RAILS.**

350 tons, 16 lb. rails, new. 500 tons, 20 lb. rails, new. 300 tons, 25 lb. rails, new.
Also 30, 35, and 40 lb. rails, new. 1000 tons relaying rails, 60 to 75 lb. sections.

**JOSEPH SCHONTHAL,**
1221 Park Building, - - - PITTSBURG, PA.

# Ideal System of Water Purification

**Installed by THE PITTSBURG FILTER MFG. CO.**

**90,000 Horse Power in use.**

Carnegie Building, PITTSBURG, PA. Telephone 2190.

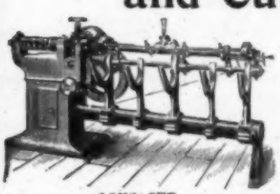
612 Betz Building, PHILADELPHIA, PA. Telephone 3,28,86.

**A. M. Crane & Company**

The Rookery, CHICAGO.

**Buy and Sell Everything.**

## Automatic Wire Straightening and Cutting Machine.



LONG CUT

Straightening and cutting directly from the coil 150 feet per minute.

All kinds of automatic machinery used in the manufacture of hardware, bicycles, saddlery hardware, cutlery metal and wire goods, etc., etc.

Manufactured by

The F. B. Shuster Company,

NEW HAVEN, CONN., U.S.A.

**Second Edition Now Ready.**

## "METALLURGY OF CAST IRON"

By THOS. D. WEST; 107 engravings, 583 pages. Just issued A valuable work to Founder, Molder, Draughtsman, Designer Technical School Specialist. Chemistry of Iron; cheaping of mixtures; the effect of the metalloids in changing the grade of iron; latest improvements in cupola construction and practice—all are fully covered. Price $3. Sent postpaid on receipt of price, by *The Iron Trade Review Co.*, Cleveland, O; 1522 Monadnock Block, Chicago, Ill.

James M. Swank, author of "Iron in All Ages," and editor of the *Bulletin* of The American Iron & Steel Association, in reviewing "Metallurgy of Cast Iron," says it is "One of the most valuable publications relating to the manufacture of iron castings, that has ever, to our knowledge been issued in this or any other country."

## Persistence in Advertising

In the expansion of business now bringing profit to so many manufacturers, advertisers who have made themselves regularly prominent in the past five years have been notable in reaping the rewards of persistent publicity.

## THE 1898 EDITION OF THE Iron and Steel Directory

Published by The American Iron and Steel Association.

Will be sent postpaid by *The Iron Trade Review* at $7. Ready now.

Is a thorough revision of the list of blas furnaces, rolling mills, Bessemer and Open-Hearth steel works, plate and sheet mills, nail mills, tin plate mills, malleable, cast iron pipe and wrought pipe works, car wheel and locomotive works, with many new lists of works in other lines.

## WANTED.

Foreman for foundry making light castings, principally malleable iron. Requisites; not to exceed 45 years of age, temperate, good executive ability and competent bench and floor molder.

Also—foreman for core department making principally small cores. Requisites; must not be over 40 years of age, temperate, goodiexecutive ability, competent core maker. Address, stating full particulars

FOUNDRY,

Station B, BUFFALO, N. Y.

## FOR SALE. Hoisting Engines.

2 11x18 75 H. P. Mine Hoists.
2 14x16 Tandem Mine Hoists.
2 7x10 D C D D with boilers complete.

Torbert & Peckham,

1605 Monadnock, CHICAGO.

## WANTED. STEEL SCRAP.

7¼ in. round or larger, 8 in. long or longer, or equal area of any other shape.

NORTHWESTERN SUPPLY CO.,
Duluth, Minn.

Mark your tools with a Steel Stamp.

Send for Price-list no. 12.

## FOR SALE. Drills.

6 Rand Little Giant 3½.
3 Ingersoll-Sargent "E."
1 " " "D."
3 Rand No. 3.
1 Rand Kid.

Torbert & Peckham,

1605 Monadnock CHICAGO.

When you write to firms advertised in our columns, please mention the fact that you took their address from our paper. They will thank you for it.

Larger paid circulation and larger list of advertising patrons than ever in its history. These THE IRON TRADE REVIEW now has. Advertising in it pays.

When writing to advertisers, please mention the Iron Trade Review.

# BUYERS' DIRECTORY.

ACETYLENE APPARATUS—
Drake Acetylene Apparatus Co., Cleveland, O.

AGRICULTURAL SHAPES—
Republic Iron & Steel Co., Chicago, Ill.
American Steel Hoop Co., New York City.
American Steel & Wire Co., Chicago, Ill.
Champion Iron & Steel Co., Muskegon, Mich.

AIR BRAKE PINS—
Vulcanus Forging Co., Cleveland, O.

AIR COMPRESSORS—
Edw. P. Allis Co., Milwaukee, Wis.
Fraser & Chalmers, Chicago, Ill.
Rand Drill Co., Chicago, Ill.
Clayton Air Compressor Works, New York.
Ingersoll-Sergeant Drill Co., New York.
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.
Vulcan Iron Works, Wilkes-Barre, Pa.
Jos. E. Bissell, Agt. Prentiss Tool & Supply Co., Pittsburg, Pa.
American Engineering Works, Chicago, Ill.

AIR HOISTS—
Northern Engineering Works, Detroit, Mich.
Whiting Foundry Equipment Co., Harvey, Ill.

AIR LIFT PUMPS—
Clayton Air Compressor Works, New York.
The Ingersoll-Sergeant Drill Co., New York.

ANALYTICAL CHEMISTS—
F. A. Emmerton, Cleveland, O.
O. Textor, Cleveland O.
The Robert W. Hunt & Co., Chicago, Ill.
Geo. C. Davis, Philadelphia, Pa.

ANGLES—
Republic Iron & Steel Co., Chicago, Ill.
American Steel Hoop Co., Pittsburg, Pa.
American Steel & Wire Co., Chicago, Ill.

ANNEALING BOXES—
Meehan Boiler & Construction Co., Lowellville, Ohio.
Wm. B. Pollock, Youngstown, O.

ANTI-FRICTION METAL—
Theo. Hiertz & Son, St. Louis, Mo.
C. H. Besly & Co., Chicago, Ill.
Wm. Cramp & Sons, Philadelphia, Pa.
Perfect Lubricating Metal Co., Cincinnati, O.
J. J. Ryan & Co., Chicago, Ill.
Somers, Fitler & Clarke, Pittsburg, Pa.

AXLES—
Bethlehem Steel Co., So. Bethlehem, Pa.

BABBITT METAL—
Theo. Hiertz & Son, St. Louis, Mo.
C. H. Besly & Co., Chicago, Ill.
Lorain Foundry Co., Lorain, O.
J. J. Ryan & Co., Chicago, Ill.

BARBED WIRE—
American Steel & Wire Co., Chicago, Ill.

BAR IRON AND STEEL—
Monongahela Iron & Steel Co., Pittsburg, Pa.
Bourne-Fuller Co., Cleveland, O.
Republic Iron & Steel Co., Chicago, Ill.
American Steel Hoop Co., Pittsburg, Pa.
C. R. Baird & Co., Philadelphia, Pa.
American Steel & Wire Co., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Birmingham, Ala.
Champion Iron & Steel Co, Muskegon, Mich.
A. M. Crane & Co., Chicago, Ill.

BEADING HAMMERS—
Cleveland Pneumatic Tool Co., Cleveland, O.
Chicago Pneumatic Tool Co., Chicago, Ill.

BELTING—
C. H. Besly & Co., Chicago, Ill.
Chicago Rawhide Mfg. Co., Chicago, Ill.
Gandy Belting Co., Baltimore, Md.
Jeffrey Mfg. Co., Columbus, O.
Link Belt Machinery Co., Chicago, Ill.
Atlas Machine Co., Pittsburg, Pa.
Somers, Fitler & Clarke, Pittsburg, Pa.

BELT DRESSING—
The Ironsides Co., Columbus, O.

BELT LACING—
The Bristol Co., Waterbury, Conn.

BLACKSMITH AND CARRIAGE SUPPLIES—
C. H. Besly & Co., Chicago, Ill.

BLAST FURNACE WORK—
Best Mfg. Co., Pittsburg, Pa.
Enterprise Boiler Co., Youngstown, O.
Meehan Boiler & Construction Co., Lewellville, Ohio.
The Wm. B. Pollock Co., Youngstown, O.
Riter-Conley Mfg. Co., Pittsburg, Pa.
Southwark Foundry & Machine Co., Philadelphia, Pa.
The United Boiler Co., Girard, O.
West Penn Foundry & Machine Co., Avonmore, Pa.
Geo. B. Sennett Co., Youngstown, O.
Pittsburg Valve, Foundry & Construction Co., Pittsburg, Pa.

BLOCKS (TACKLE)—
A. Leschen & Sons Rope Co., St. Louis, Mo.

BLOWING ENGINES—
Southwark Foundry & Machine Co., Philadelphia, Pa.
Edward P. Allis Co., Milwaukee, Wis.

BOILERS—
Hyde Bros. & Co., Pittsburg, Pa.
The Wm. B. Pollock Co., Youngstown, O.
Cahall Sales Department, Pittsburg, Pa.
Enterprise Boiler Co., Youngstown, O.
The Edward P. Allis Co., Milwaukee, Wis.
Hooven, Owens & Rentschler Co., Hamilton, O.
Harrison Safety Boiler Works, Philadelphia.
Meehan Boiler & Construction Co., Lowellville, O.
Wm. Cramp & Sons, Philadelphia, Pa.
Riter-Conley Mfg. Co., Pittsburg, Pa.
The Aultman Co, Canton, O.
Fraser & Chalmers, Chicago, Ill.
The United Boiler Co., Girard, O.
Atlas Machine Co., Pittsburg, Pa.
Vulcan Iron Works, Wilkes-Barre, Pa.
Wickes Bros., Pittsburg, Pa.

BOILER COVERING—
C. H. Besly & Co., Chicago, Ill.

BOILER COMPOUNDS—
The Ironsides Company, Columbus, Ohio.

BOILER TUBES—
S. Fix Sons, Cleveland, O.
National Tube Co., Pittsburg, Pa.

BOLTS AND NUTS—
Upson Nut Co., Cleveland, O.
National Elastic Nut Co., Milwaukee, Wis.
Milton Manufacturing Co., Milton, Pa.
Vulcanus Forging Co., Cleveland, O.
Somers, Fitler & Clarke, Pittsburg, Pa.

BORING AND TURNING MILLS—
H. Bickford, Lakeport, N. H.
U. Baird Machinery Co., Pittsburg, Pa.
Bickford Drill and Tool Co., Cincinnati, O.
Atlas Mahine Co., Pittsburg, Pa.
Jos. E. Bissell, Agt. Prentiss Tool & Supply Co., Pittsburg, Pa.

BOX CAR UNLOADER—
The Jeffrey Mfg. Co., Columbus, O.

BRASS CASTINGS—
J. J. Ryan & Co., Chicago, Ill.
Lorain Foundry Co., Lorain, O.
The Lunkenheimer Co., Cincinnati, O.

BRIDGES—
Wm. B. Scaife & Sons, Pittsburg, Pa.
American Bridge Co., New York City.

BRIDGES (SUSPENSION)—
A. Leschen & Sons Rope Co., St. Louis, Mo.

BUILDINGS (STEEL FRAME)
Illinois Steel Co., Chicago, Ill.
Wm. B. Scaife & Sons, Pittsburg, Pa.
Shiffler Bridge Co., Pittsburg, Pa.
Riter-Conley Mfg. Co., Pittsburg, Pa.
American Bridge Co., New York City.
Pittsburg Steel Construction Co., Pittsburg.

CABLES (WIRE)
A. Leschen & Sons Rope Co., St. Louis, Mo.
American Steel & Wire Co., Chicago, Ill.
Somers, Fitler & Clarke, Pittsburg, Pa.

CABLEWAYS—
Lidgerwood Mfg. Co., New York City.
Waterbury Rope Co., New York City.

CARBORUNDUM—
The Carborundum Co., Niagara Falls, N. Y.

CARS—
The Pressed Steel Car Co., Pittsburg, Pa.

CARRYING TONGS—
Vulcan Mfg. Co., Pitsburg. Pa.

CASTINGS—
Seaman-Sleeth Co., Pittsburg, Pa.
Hooven, Owens & Rentschler Co., Hamilton, O.
W. A. Jones Foundry Co., Chicago, Ill.
Brass Founders' Supply Co., Newark, N. J.
Schuylkill Iron & Steel Co., Philadelphia, Pa.
The Aultman Co., Canton, O.
Wheeling Mold & Foundry Co., Wheeling, W. Va.
Lorain Foundry Co., Lorain, O.
West Penn Foundry & Machine Co., Avonmore, Pa.
Link Belt Machinery Co., Chicago, Ill.
Massillon Iron & Steel Co., Chicago, Ill.
E. R. Allen, Corning, N. Y.
Geo. B. Sennett Co., Youngstown, O.

CASTINGS (ALUMINUM)—
J. J. Ryan & Co., Chicago, Ill.

CASTINGS (BRASS)—
Best Mfg. Co., Pittsburg, Pa.
J. J. Ryan & Co., Chicago, Ill.
Lorain Foundry Co., Lorain, O.
The Lunkenheimer Co., Cincinnati, O.

CASTINGS (BRONZE)—
J. J. Ryan & Co., Chicago, Ill.
Lorain Foundry Co., Lorain, O.
The Lunkenheimer Co., Cincinnati, O.

CASTINGS (MALLEABLE)—
Acme Steel & Malleable Iron Works, Buffalo.
Meadville Malleable Iron Co., Meadville, Pa.

CASTINGS (STEEL)—
Bethlehem Steel Co., South Bethlehem, Pa.
Otis Steel Co., Cleveland, O.
Acme Steel & Malleable Iron Works, Buffalo.
The Sargent Co., Chicago, Ill.

CAULKING HAMMERS—
Cleveland Pneumatic Tool Co., Cleveland, O.
Chicago Pneumatic Tool Co., Chicago, Ill.

CEMENT—
Garden City Sand Co., Chicago, Ill.
Reed F. Blair & Co., Pittsburg, Pa.

CHAIN—
Standard Chain Co., Pittsburg, Pa.
Somers, Fitler & Clarke, Pittsburg, Pa.

CHAIN BELTING—
Jeffrey Mfg. Co., Columbus, O.
Link-Belt Machinery Co., Chicago, Ill.
The Aultman Co., Canton, O.

CHANNELERS—
The Ingersoll-Sergeant Drill Co., New York.

CHANNELS—
American Steel Hoop Co., New York City.

CHEMISTS—
F. A. Emmerton, Cleveland, O.
O. Texter, Cleveland, O.
The R. W. Hunt & Co., Chicago, Ill.
Grasselli Chemical Co., Cleveland, O.
We Fu Go Co., Cincinnati, O.
Geo. C. Davis, Philadelphia, Pa.

CHILLED AND SAND ROLLS—
Wm. Tod & Co., Youngstown, O.
Seaman, Sleeth Co., Pittsburg, Pa.
Totten & Hogg Iron and Steel Foundry Co., Pittsburg, Pa.
Lorain Foundry Co., Lorain, O.
West Penn Foundry & Machine Co., Avonmore, Pa.
Frank-Kneeland Machine Co., Pittsburg, Pa.
A. Garrison Foundry Co., Pittsburg, Pa.
Canton Roll & Machine Co., Canton, O.

CHIPPING HAMMERS—
Cleveland Pneumatic Tool Co., Cleveland, O.
Chicago Pneumatic Tool Co., Chicago, Ill.

CHUCKS—
Pratt Chuck Co., Frankfort, N. Y.
Somers, Fitler & Clarke, Pittsburg, Pa.

COAL CUTTERS—
The Ingersoll-Sergeant Drill Co., New York.
Jeffrey Mfg. Co., Columbus, O.
Link Belt Machinery Co., Chicago, Ill.

COAL SCREENS—
Hendrick Mfg. Co., Carbondale, Pa.
Rob't Aitchinson Per. Metal Co., Chicago, Ill.
Jeffrey Mfg. Co., Columbus, O.
The Aultman Co., Canton, O.
Western Machinery & Supply Co., Chicago, Ill.

COAL AND COKE—
M. A. Hanna & Co., Cleveland, O.
Rogers, Brown & Co., Cincinnati, O.
Jerome Keeley & Co., Philadelphia, Pa.
Reed F. Blair & Co., Pittsburg, Pa.
Pilling & Crane, Philadelphia, Pa.
Pickand, Brown & Co., Chicago, Ill.
H. C. Frick Coke Co., Pittsburg, Pa.
McKeefrey & Co., Leetonia, O.
Pickands, Mather & Co., Cleveland, O.
J. H. Hillman & Son, Pittsburg, Pa.
Cherry Valley Iron Co., Pittsburg, Pa.
Bessemer Coke Co., Pittsburg, Pa.
Tennessee Coal, Iron & Railroad Co., Birmingham, Ala.
Alabama Consolidated Coal & Iron Co., Birmingham, Ala.
A. M. Crane & Co., Chicago, Ill.
O'Gara, King & Co., Chicago, Ill.
Robert Field & Co., Columbus, O.

COAL HANDLING MACHINERY—
A. Leschen & Sons Rope Co., St. Louis, Mo.

COAL MINING MACHINERY—
Jeffrey Mfg. Co., Columbus, O.
Webster, Camp & Lane Machine Co., Akron, O.
Link Belt Machinery Co., Chicago, Ill.
A. Leschen & Sons Rope Co., St. Louis, Mo.

COLD SAWS—
J. R. Vandyck, New York City, N. Y.

COMPAROMETERS—
Vulcan Mfg. Co., Pittsburg, Pa.

COMPRESSION COUPLINGS—
The Aultman Co., Canton, O.
Geo. B. Sennett Co., Youngstown, O.

CONDENSERS—
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.

CONTRACTORS' SUPPLIES—
A. Leschen & Sons Rope Co., St. Louis, Mo.

CONVEYING MACHINERY—
A. Leschen & Sons Rope Co., St. Louis, Mo.
American Engineering Works, Chicago, Ill.

CONVEYORS—
Jeffrey Mfg. Co., Columbus, O.
Link-Belt Machinery Co., Chicago, Ill.
Exeter Machine Works, Pittston, Pa.
The Aultman Co., Canton, O.
The Brown Hoisting Machinery Co., Cleveland.
Webster Camp & Lane Machine Co., Akron, O.

COPPER GASKETS—
Drake Acetylene Apparatus Co., Cleveland, O.

CORE OVENS—
Millett Core Oven Co., Brightwood, Conn.

CORRESPONDENCE SCHOOLS—
International Correspondence Schools, Scranton, Pa.

CORRUGATED IRON—
Berger Mfg. Co., Canton, O.
Wm. B. Scaife & Sons, Pittsburg, Pa.
American Sheet Steel Co., New York City.

COTTON TIES—
American Steel Hoop Co., Pittsburg, Pa.
American Steel & Wire Co., Chicago, Ill.

CRANES—
Cleveland Punch & Shear Wks. Co., Cleveland.
Northern Engineering Works, Detroit, Mich.
Wm. Tod & Co., Youngstown, O.
The Bucyrus Co., South Milwaukee, Wis.
Marion Steam Shovel Co., Marion, O.
Torbert & Peckham, Chicago, Ill.
The Brown Hoisting Machinery Co., Cleveland.
Cleveland Crane & Car Co., Cleveland, O.
R. D. Wood & Co., Philadelphia, Pa.
Whiting Foundry Equipment Co., Harvey, Ill.
Atlas Machine Co., Pittsburg, Pa.
S. Obermayer Co., Cincinnati, O., and Chicago.

CRANES AND DERRICKS—
A. Leschen & Sons Rope Co., St. Louis, Mo.

CRANK PINS—
Bethlehem Steel Co., S. Bethlehem, Pa.

CRUSHING MACHINERY—
Raymond Bros. Impact Pulverizer Co., Chicago.

CUPOLAS—
Riter-Conley Mfg. Co., Pittsburg, Pa.
Northern Engineering Works, Detroit, Mich.
The United Boiler Co., Girard, O.
Wm. B. Pollock Co., Youngstown, O.
Whiting Foundry Equipment Co., Harvey, Ill.
S. Obermayer Co., Cincinnati, O., and Chicago, Ill.

DECALCOMANIUS—
Scientific Manufacturing Co., Chicago, Ill.

DIES—
Danielson Machine & Tool Co., Cleveland, O.
American Steel & Wire Co., Chicago, Ill.

DREDGES—
Marion Steam Shovel Co., Marion, O.
The Bucyrus Co., South Milwaukee, Wis.
The Jeffrey Mfg. Co., Columbus, O.
Thew Automatic Shovel Co., Lorain, O.

DRILL GRINDERS—
J. Wendell Cole, Columbus, O.
Somers, Fitler & Clarke, Pittsburg, Pa.

DRILLING MACHINERY—
Keystone Driller Co., Beaver Falls, Pa.

DRILL PRESSES—
Cleveland Punch & Shear Wks. Co., Cleveland.
C. H. Besly & Co., Chicago, Ill.
U. Baird Machinery Co., Pittsburg, Pa.
Bickford Drill & Tool Co., Cincinnati, O.
Danielson Machine & Tool Co., Cleveland, O.
Jos. E. Bissell, Agt. Prentiss Tool & Supply Co., Pittsburg, Pa.
Somers, Fitler & Clarke, Pittsburg, Pa.

DROP FORGINGS—
Wyman & Gordon, Worcester, Mass.
Chicago Drop Forge & Foundry Co., Kensington, Ill.
Jas. H. Baker Mfg. Co., Pittsburg, Pa.
Frankford Steel & Forging Co., Philadelphia.
E. D. Clapp Mfg. Co., Auburn, N. Y.

DROP HAMMERS—
Cleveland Punch & Shear Wks. Co., Cleveland.

DROP PRESSES—
Avery Stamping Co., Cleveland, O.
Bertsch & Co., Cambridge City, Ind.
C. H. Besly & Co., Chicago, Ill.
Danielson Machine & Tool Co., Cleveland, O.
Cleveland Punch & Shear Wks. Co., Cleveland.
Bethlehem F'dry & Mach. Co., Bethlehem, Pa.

DYNAMOS—
Jeffrey Mfg. Co., Columbus, O.

EAVE TROUGHS AND CONDUCTORS—
Berger Mfg. Co., Canton, O.

ELECTRICAL MACHINERY SUPPLIES—
A. Leschen & Sons Rope Co., St. Louis, Mo.
Pelton Engineering Co., Cleveland, O.

ELECTRICAL WIRES AND CABLES—
American Steel & Wire Co., Chicago, Ill.

ELEVATING AND CONVEYING MACHINERY—
Jeffrey Mfg. Co., Columbus, O.
Link-Belt Machinery Co., Chicago, Ill.
Lidgerwood Mfg. Co., New York City.
Exeter Machine Works, Pittston, Pa.
The Aultman Co., Canton, O.
The Brown Hoisting Machinery Co., Cleveland, O.
Webster Camp & Lane Machine Co., Akron, O.
American Engineering Works, Chicago, Ill.

EMERY AND CORUNDUM WHEELS—
C. H. Besly & Co., Chicago, Ill.
J. Wendell Cole, Columbus and Chicago.
Northampton Emery Wheel Co., Chicago, Ill.
Somers, Fitler & Clarke, Pittsburg, Pa.
The Carborundum Co., Niagara Falls, N. Y.

EMERY WHEEL MACHINERY—
J. Wendell Cole, M. E., Columbus, O., or Chicago.
C. H. Besly & Co., Chicago, Ill.
Northampton Emery Wheel Co., Chicago, Ill.

ENGINEERS AND CONTRACTORS—
Best Mfg. Co., Pittsburg, Pa.
Wellman-Seaver Engineering Co., Cleveland, O
Walter Kennedy, Pittsburg, Pa.
Meehan Boiler & Construction Co., Lowellville.
E. E. Erickson, Pittsburg, Pa.
Riter-Conley Mfg. Co., Pittsburg, Pa.
Julian Kennedy, Pittsburg, Pa.
Jeffrey Mfg. Co., Columbus, O.
Alex. Laughlin & Co., Pittsburg, Pa.
We Fu Go Co., Cincinnati, O.
David Lamond, Pittsburg, Pa.
Pittsburg Steel Construction Co., Pittsburg, Pa.
Pittsburg Valve, Foundry & Construction Co., Pittsburg, Pa.
American Engineering Works, Chicago, Ill.

ENGINE PACKING—
Jenkins Bros., New York City.
C. H. Besly & Co., Chicago, Ill.

ENGINEERS' SUPPLIES—
C. H. Besly & Co., Chicago, Il.
Jenkins Bros., New York City.
Wright Mfg. Co., Cleveland, O.
Drake Acetylene Apparatus Co., Cleveland, O.
The Lunkenheimer Co., Cincinnati, O.
The Crane Co., Chicago, Ill.

ENGINE LATHES—
U. Baird Machinery Co., Pittsburg, Pa.
Jos. E. Bissell, Agt. Prentiss Tool & Supply Co., Pittsburg, Pa.
Somers, Fitler & Clarke, Pittsburg, Pa.

ENGINES (Oil) —
The Aultman Co., Canton, O.

ENGINES (Steam)—
Wm. Tod & Co., Youngstown, O.
The Edward P. Allis Co., Milwaukee, Wis.
Somers, Fitler & Clarke, Pittsburg, Pa.
The Hooven, Owens & Rentschler Co., Hamilton, O.
The Aultman Co., Canton, O.
Vulcan Iron Works, Wilkes-Barre, Pa.
Wickes Bros., Pittsburg, Pa.

ENGRAVERS AND ELECTROTYPERS—
Rosenow & Co., Chicago, Ill.

FEED WATER HEATERS AND PURIFIERS—
Harrison Safety Boiler Works, Philadelphia.
We Fu Go Co., Cincinnati, O.
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.

FELLOE PLATES—
Avery Stamping Co., Cleveland, O.

FILES, MAKERS OF—
C. H. Besly & Co., Chicago, Ill.

FILTER PRESSES—
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.

FILTERS—
Wm. B. Scaife & Sons, Pittsburg, Pa.
Pittsburg Filter Mfg. Co., Pittsburg, Pa.

FIRE BRICK AND CLAY—
J. V. Rose & Son, Sharon, Pa.
Union Mining Co., Mt. Savage, Md.
Clearfield Fire Brick Co., Clearfield, Pa.
Dover Fire Brick Co., Cleveland, O.
F. B. Stevens, Detroit, Mich.
Chicago Fire Brick Co., Chicago, Ill.
Scioto Star Fire Brick Works, Portsmouth, O.
Kentucky Fire Brick Works, Portsmouth, O.
Webster Fire Brick Co., South Webster, O.
Oak Hill Fire Brick & Coal Co., Oak Hill, O.
F. B. Holmes & Co., Detroit, Mich.
W. H. Haws Fire Brick Co., Mt. Union, Pa.
Garden City Sand Co., Chicago, Ill.
A. F. Smith & Co., New Brighton, Pa.
A. J. Hawes & Son, Johnstown, Pa.
S. Obermayer Co., Cincinnati, O., and Chicago.
Scioto Fire Brick Co., Sciotoville, O.
Crown Fire Clay Co., Akron, O.
Reese-Hammond Fire Brick Co., Bolivar, Pa.
John H. Ehlen, Newport, Ky.

FIRE PROOF COVERING—
C. H. Besly & Co., Chicago, Ill.
Somers, Fitler & Clarke, Pittsburg, Pa.

FOOT AND POWER LATHES—
U. Baird Machinery Co., Pittsburg, Pa.

FORGINGS—
Chicago Drop Forge & Foundry Co., Kensington, Ill.
Cleveland City Forge & Iron Co., Cleveland, O
Bethlehem Steel Co., South Bethlehem, Pa.
Wyman & Gordon, Worcester, Mass.
Danielson Machine & Tool Co., Cleveland, O.
Samuel Trethewey & Co., Pittsburg, Pa.
Jas. H. Baker Mfg. Co., Pittsburg, Pa.
Frankford Steel & Forging Co., Philadelphia.
Pilling & Crane, Philadelphia, Pa.
Vulcanus Forging Co., Cleveland, O.
E. D. Clapp Mfg. Co., Auburn, N. Y.
Geo. B. Sennett Co., Youngstown, O.

FOUNDRIES—
Best Mfg. Co., Pittsburg, Pa.
Wm. Tod & Co., Youngstown, O.
Seaman, Sleeth Co., Pittsburg, Pa.
Hooven, Owens & Rentschler Co., Hamilton, O.
Link Belt Machinery Co., Chicago, Ill.
W. A. Jones Foundry Co., Chicago.
Jeffrey Mfg. Co., Columbus, O.
Brass Founders' Supply Co., Newark, N. J.
The Aultman Co., Canton, O.
Schuykill Iron & Steel Co., Philadelphia, Pa.
Wheeling Mold and Foundry Co., Wheeling, W. Va.
E. R. Allen, Corning, N. Y.
Pittsburg Valve, Foundry & Construction Co., Pittsburg, Pa.

FOUNDRY EQUIPMENT—
Tabor Mfg. Co., Philadelphia, Pa.
Brass Founders' Supply Co., Newark, N. J.
Vulcan Mfg. Co., Pittsburg, Pa.
Northern Engineering Works, Detroit, Mich.
Cleveland Crane & Car Co., Cleveland, O.
S. Obermayer Co., Cincinnati, O., and Chicago.
Jos. E. Bissell, Agt. Prentiss Tool & Supply Co., Pittsburg, Pa.
Chicago Pneumatic Tool Co., Chicago, Ill.
Macleod & Clark, Cincinnati, O.
The W. J. Clark Co., Salem, O.
Millett Core Oven Co., Brightwood, Conn.

FOUNDRY FACINGS—
Cleveland Facing Mill Co., Cleveland, O.
S. Obermayer Co., Cincinnati, O., and Chicago.

FOUNDRY SUPPLIES—
Northern Engineering Works, Detroit, Mich.
Clearfield Fire Brick Co., Clearfield, Pa.
Cleveland Crane & Car Co., Cleveland, O.
The Ohio Sand Co., Conneaut, O.
Union Mining Co., Mt. Savage, Md.
Dover Fire-Brick Co., Cleveland, O.
A. F. Smith & Co., New Brighton, Pa.
Tabor Mfg. Co., Philadelphia, Pa.
F. B. Stevens, Detroit, Mich.
W. H. Haws Fire Brick Co., Mt. Union, Pa.
Cleveland Facing Mill Co., Cleveland, O.
Garden City Sand Co., Chicago, Ill.
Chicago Fire Brick Co., Chicago, Ill.
Brass Founders' Supply Co., Newark, N. J.
Vulcan Mfg. Co., Pittsburg, Pa.
Scioto Star Fire Brick Works, Portsmouth, O.
Kentucky Fire Brick Works, Portsmouth, O.
Webster Fire Brick Co., South Webster, O.
J. V. Rose & Son, Sharon, Pa.
Oak Hill Fire Brick & Coal Co., Oak Hill, O
F. B. Holmes & Co., Detroit, Mich.
A. J. Haws & Son, Johnstown, Pa.
Webster Foundry Sand Co., Philadelphia, Pa.
S. Obermayer Co., Cincinnati, O., and Chicago.
Scioto Fire Brick Co., Sciotoville, O.
Newport Sand Bank Co., Newport, Ky.
Crown Fire Clay Co., Akron, O.
Reese-Hammond Fire Brick Co., Bolivar, Pa.
John H. Ehlen, Newport, Ky.
Millett Core Oven Co., Brightwood, Conn.
Somers, Fitler & Clarke, Pittsburg, Pa.

FRICTION METAL—
Theo. Hiertz & Son, St. Louis, Mo.
C. H. Besly & Co., Chicago, Ill.
Perfect Lubricating Metal Co., Cincinnati, O.
J. J. Ryan & Co., Chicago, Ill.

FURNACE LININGS—
Union Mining Co., Mt. Savage, Md.

FUEL OIL BURNERS—
Rockwell Engineering Co., New York City.

GAGE COCKS—
The Lunkenheimer Co., Cincinnati, O.

GALVANIZED IRON—
American Sheet Steel Co., New York City.
McCullough Iron Co., Wilmington, Del.

GALVANIZERS—
American Sheet Steel Co., New York City.

GALVANIZING POTS—
The Wm. B. Pollock Co., Youngstown, O.

GAS ENGINES—
Northern Engineering Works, Detroit, Mich.
Columbus Machine Co., Columbus, O.
Atlas Machine Co., Pittsburg, Pa.
Somers, Fitler & Clarke, Pittsburg, Pa.

GAS PRODUCERS—
R. D. Wood & Co., Philadelphia, Pa.

GAUGES (Rolling Mill)—
Haines Gauge Co., Philadelphia, Pa.

GEARING—
I. & E. Greenwald Co., Cincinnati, O.
The R. D. Nuttall Co., Allegheny, Pa.
The Van Dorn & Dutton Co., Cleveland, O.
F. H. Bultman & Co., Cleveland, O.
Fraser & Chalmers, Chicago, Ill.
Southwark Foundry & Machine Co., Philadelphia, Pa.
James Bonar & Co., Pittsburg, Pa.
Link Belt Machinery Co., Chicago, Ill.
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.

GEAR CUTTERS—
F. H. Bultman & Co., Cleveland, O.

GEAR CUTTING—
The R. D. Nuttall Co., Allegheny, Pa.
The Van Dorn & Dutton Co., Cleveland, O.
F. H. Bultman & Co., Cleveland, O.

GEAR LUBRICANTS—
The Ironsides Company, Columbus, O.

GIRDER WORK—
Wm. B. Scaife & Sons, Pittsburg, Pa.

GRINDING MACHINERY—
Raymond Bros. Impact Pulverizer Co., Chicago.

GRINDSTONES—
C. H. Besly & Co., Chicago, Ill.

GRAPHITE PAINT—
Jos. Dixon Crucible Co., Jersey City, N. J.

HACK SAWS—
Cleveland Punch & Shear Wks. Co., Cleveland.

HANGERS—
E. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.
I. & E. Greenwald Co., Cincinnati, O.
Link Belt Machinery Co., Chicago, Ill.
Somers, Fitler & Clarke, Pittsburg, Pa.

HARNESS SNAPS—
Covert Mfg. Co., West Troy, N. Y.

HEATERS AND PURIFIERS—
Harrison Safety Boiler Works, Philadelphia.
We Fu Go Co., Cincinnati, O.
The United Boiler Co., Girard, O.

HEAVY HARDWARE—
C. H. Besly & Co., Chicago, Ill.

HOISTS—
The Aultman Co., Canton, O.
Lidgerwood Mfg. Co., New York City.

HOISTING ENGINES—
The Edward P. Allis Co., Milwaukee, Wis.
Lidgerwood Mfg. Co., New York City.
Exeter Machine Works, Pittston, Pa.
The Aultman Co., Canton, O.
Webster, Camp & Lane Machine Co., Akron, O.
Vulcan Iron Works, Wilkes-Barre, Pa.
Torbert & Peckham, Chicago, Ill.
Somers, Fitler & Clarke, Pittsburg, Pa.

HOISTING MACHINERY—
Exeter Machine Works, Pittston, Pa.
Link-Belt Machinery Co., Chicago, Ill.
Jeffrey Mfg. Co., Columbus, O.
Lidgerwood Mfg. Co., New York City.
The Aultman Co., Canton, O.
The Brown Hoisting Machinery Co., Cleveland, O.
Webster, Camp & Lane Machine Co., Akron, O.
A. Leschen & Sons Rope Co., St. Louis, Mo.

HOISTING ROPE (Wire)—
American Steel & Wire Co., Chicago, Ill.

HORSE SHOES—
Phoenix Horse Shoe Co., Joliet, Ill.
American Steel & Wire Co., Chicago, Ill.

HYDRAULIC TOOLS—
R. D. Wood & Co., Philadelphia, Pa.

INDUSTRIAL CARS—
The Pressed Steel Car Co., Pittsburg, Pa.

INGOT MOLDS—
Lorain Foundry Co., Lorain, O.

INJECTORS—
C. H. Besly & Co., Chicago, Ill.
The Lunkenheimer Co., Cincinnati, O.
Somers, Fitler & Clarke, Pittsburg, Pa.

INSURANCE COMPANIES—
Hartford Steam Boiler I. & I. Co., Hartford, Ct.

IRON BUILDINGS—
Illinois Steel Co., Chicago, Ill.
Riter-Conley Co., Pittsburg, Pa.
Wm. B. Scaife & Sons, Pittsburg, Pa.
American Bridge Co., New York City.
Pittsburg Steel Construction Co., Pittsburg, Pa.

IRON, NAILS AND STEEL—
C. H. Besly & Co., Chicago, Ill.

IRON AND STEEL ROOFING—
Berger Mfg. Co., Canton, O.
Wm. B. Scaife & Sons, Pittsburg, Pa.
McCullough Iron Co., Wilmington, Del.

IRON ORE—
Lake Superior Consolidated Iron Mines, New York City, N. Y.
Oglebay, Norton & Co., Cleveland, O.
Pickands, Brown & Co., Chicago, Ill.
M. A. Hanna & Co., Cleveland, O.
Drake, Bartow & Co., Cleveland, O.
Pickands, Mather & Co., Cleveland, O.
J. Wesley Pullman, Philadelphia, Pa.
Tod, Stambaugh & Co., Cleveland, O.
Jerome Keeley & Co., Philadelphia, Pa.

IRON WORKING MACHINERY—
Atlas Machine Co., Pittsburg, Pa.

IRON WORKING TOOLS—
Avery Stamping Co., Cleveland, O.
Cleveland Punch & Shear Wks. Co., Cleveland.
H. Bickford, Lakeport, N. H.
C. H. Besly & Co., Chicago, Ill.
U. Baird Machinery Co., Pittsburg, Pa.
Armstrong Bros. Tool Co., Chicago, Ill.
F. H. Bultman & Co., Cleveland, O.
The Armstrong Mfg. Co., Bridgeport, Conn.
Bickford Drill & Tool Co., Cincinnati, O.
Bertsch & Co., Cambridge City, Ind.
Thos. P. Conard, Philadelphia, Pa.
C. C. Wormer Machinery Co., Detroit, Mich.
Carlin Machinery & Supply Co., Allegheny, Pa.
Bethlehem F'dry & Mach. Co., S.Bethlehem,Pa
Jos. K. Bissell, Agt. Prentiss Tool & Supply Co., Pittsburg, Pa.
Springfield Machine Tool Co., Springfield, O.
Pratt Chuck Co., Frankfort, N. Y.
Somers, Fitler & Clarke, Pittsburg, Pa.

LADLES—
Northern Engineering Works, Detroit, Mich.
The United Boiler Co., Girard, O.
The W. J. Clark Co., Salem, O.
Wm. B. Pollock Co., Youngstown, O.
Whiting Foundry Equipment Co., Harvey, Ill.
S. Obermayer Co., Cincinnati, O., and Chicago.

LAG SCREWS—
Vulcanus Forging Co., Cleveland, O.

LATHES—
U. Baird Machinery Co., Pittsburg, Pa.
Bickford Drill & Tool Co., Cincinnati, O.
Danielson Machine & Tool Co., Cleveland, O.
Springfield Machine Tool Co., Springfield, O.
Joseph E. Bissell, Agt. Prentiss Tool & Supply Co., Pittsburg, Pa.
Somers, Fitler & Clarke, Pittsburg, Pa.

LATHE TOOLS—
Armstrong Bros. Tool Co., Chicago, Ill.

LINK BELTING—
The Jeffrey Mfg. Co., Columbus, O.
Link-Belt Machinery Co., Chicago, Ill.
The Aultman Co., Canton, O.

LOCOMOTIVES—
Hyde Bros. & Co., Pittsburg, Pa.

LUBRICANTS—
The Ironsides Co., Columbus, O.

LUBRICATING DEVICES—
The Lunkenheimer Co., Cincinnati, O.
Somers, Fitler & Clarke, Pittsburg, Pa.

MACHINE TOOLS—
H. Bickford, Lakeport, N. H.
C. H. Besly & Co., Chicago, Ill.
U. Baird Machinery Co., Pittsburg, Pa.
Bertsch & Co., Cambridge City, Ind.
Armstrong Bros. Tool Co., Chicago, Ill.
Bickford Drill & Tool Co., Cincinnati, O.
Danielson Machine & Tool Co., Cleveland, O.
F. H. Bultman & Co., Cleveland, O.
Cleveland Punch & Shear Wks. Co., Cleveland.
Wickes Bros., Pittsburg, Pa.
Carlin Machinery & Supply Co., Allegheny, Pa.
C. C. Wormer Machinery Co., Detroit, Mich.
Bethlehem F'dry & Mach. Co., S.Bethlehem,Pa
Pelton Engineering Co., Cleveland, O.
Atlas Machine Co., Pittsburg, Pa.
Joseph E. Bissell, Agt. Prentiss Tool & Supply Co., Pittsburg, Pa.
F. B. Shuster Co., New Haven, Conn.
Somers, Fitler & Clarke, Pittsburg, Pa.
Springfield Machine Tool Co., Springfield, O.
American Engineering Works, Chicago, Ill.

MACHINE SCREWS—
C. H. Besly & Co., Chicago, Ill.
Somers, Fitler & Clarke, Pittsburg, Pa.

MACHINERY AND TOOL STEEL—
C. H. Besly & Co., Chicago, Ill.
Crescent Steel Co., Pittsburg, Pa.
Byron H. White, Chicago, Ill.
Monongahela Iron & Steel Co., Pittsburg, Pa.
American Steel & Wire Co., Chicago, Ill.
Somers, Fitler & Clarke, Pittsburg, Pa.

MAGNESIA COVERING—
C. H. Besly & Co., Chicago, Ill.

MALLEABLE CASTINGS—
Acme Steel & Malleable Iron Works, Buffalo, N. Y.
Link Belt Machinery Co., Chicago, Ill.
Meadville Malleable Iron Co., Meadville, Pa.

MANILLA ROPE—
A. Leschen & Sons Rope Co., St. Louis, Mo.

MANILLA ROPE COATING—
The Ironsides Co., Columbus, O.

MANUFACTURING CHEMISTS—
We Fu Go Co., Cincinnati, O.
Grasselli Chemical Co., Cleveland, O.

METAL BEARINGS—
Theo. Hiertz & Son, St. Louis, Mo.
C. H. Besly & Co., Chicago, Ill.
Perfect Lubricating Metal Co., Cincinnati, O.
J. J. Ryan & Co., Chicago, Ill.

METAL CEILINGS—
Berger Manufacturing Co., Canton, O.

METAL SAWS—
J. R. Vandyck, New York City, N. Y.

METAL WORK—
Avery Stamping Co., Cleveland, O.

MILL CASTINGS—
Schuylkill Iron & Steel Co., Philadelphia, Pa.
A. Garrison Foundry Co., Pittsburg, Pa.

MILLING MACHINES—
U. Baird Machinery Co., Pittsburg, Pa.
Danielson Machine & Tool Co., Cleveland, O.

MILLING MACHINERY—
Raymond Bros. Impact Pulverizer Co., Chicago.

MINING MACHINERY—
C. H. Besly & Co., Chicago, Ill.
The Edward P. Allis Co., Milwaukee, Wis.
Jeffrey Mfg. Co. Columbus, O.
Lidgerwood Mfg. Co., New York City.
Exeter Machine Works, Pittston, Pa.
Wm. Cramp & Sons, Philadelphia, Pa.
The Bucyrus Co., South Milwaukee, Wis.
Marion Steam Shovel Co., Marion, O.
Webster, Camp & Lane Machine Co., Akron, O.
Fraser & Chalmers, Chicago, Ill.
Wm. B. Pollock Co., Youngstown, O.
Link Belt Machinery Co., Chicago, Ill.
Thew Automatic Shovel Co., Lorain, O.
Torbert & Pecknam, Chicago, Ill.
A. Leschen & Sons Rope Co., St. Louis, Mo.
Carlin Machinery & Supply Co., Allegheny, Pa.
Vulcan Iron Works, Wilkes-Barre, Pa.
Raymond Bros. Impact Pulverizer Co.,Chicago.
American Engineering Works, Chicago, Ill.

MINE PUMPS—
F. M. Prescott Steam Pump Co., Milwaukee, Wis.
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.
Torbert & Peckham, Chicago, Ill.
Somers, Fitler & Clarke, Pittsburg, Pa.

MOLDING MACHINES—
Tabor Mfg. Co., Philadelphia, Pa.
Whiting Foundry Equipment Co., Harvey, Ill.
S. Obermayer Co., Cincinnati, O., and Chicago.

MOLDING SAND—
Ohio Sand Co., Conneaut, O.
F. B. Stevens, Detroit, Mich.
Garden City Sand Co., Chicago, Ill.
Webster Foundry Sand Co., Philadelphia, Pa.
Newport Sand Bank Co., Newport, Ky.
S. Obermayer Co., Cincinnati, O., and Chicago.
John H. Ehlen, Newport, Ky.

MULTIPLE DRILLS—
Bickford Drill & Tool Co., Cincinnati, O.
Cleveland Punch & Shear Wks. Co., Cleveland.
Jos. E. Bissell, Agt. Prentiss Tool & Supply Co., Pittsburg, Pa.

NICKEL PLATING OUTFITS—
Northampton Emery Wheel Co., Chicago, Ill.

NUTS (SELF LOCKING)—
National Elastic Nut Co., Milwaukee, Wis.

NUTS AND BOLTS—
Upson Nut Co., Cleveland, O.
National Elastic Nut Co., Milwaukee, Wis.
Milton Manufacturing Co., Milton, Pa.

OILLESS BEARINGS—
C. H. Besly & Co., Chicago, Ill.

OIL BURNERS—
Rockwell Engineering Co., New York City.

OIL CUPS—
C. H. Besly & Co., Chicago, Ill.
The Lunkenheimer Co., Cincinnati, O.
The Crane Co., Chicago, Ill.
Somers, Fitler & Clarke, Pittsburg, Pa.

OIL PUMPS—
C. H. Besly & Co., Chicago, Ill.
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.
The Lunkenheimer Co., Cincinnati, O.

OIL STORAGE TANKS—
Wm. B. Pollock Co., Youngstown, O.

OIL SEPARATORS—
Harrison Safety Boiler Works, Philadelphia.

OIL TANKS AND CARS—
Wm. B. Pollock Co., Youngstown, O.

ORE CARS—
The Pressed Steel Car Co., Pittsburg, Pa.

ORE CRUSHERS—
The Edward P. Allis Co., Milwaukee, Wis.
Jeffrey Mfg. Co., Columbus, O.
The Aultman Co., Canton, O.
Fraser & Chalmers, Chicago, Ill.

ORE HANDLING MACHINERY—
A. Leschen & Sons Rope Co., St. Louis, Mo.

ORE SCREENS—
Rob't Aitchison Per. Metal Co., Chicago, Ill.
The Aultman Co., Canton, O.
Fraser & Chalmers, Chicago, Ill.
Hendrick Mfg. Co., Carbondale, Pa.

ORE TESTING MACHINERY—
Keystone Driller Co., Beaver Falls, Pa.

PACKING—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.
A. Leschen & Sons Rope Co., St. Louis, Mo.

PAINT—
Iron Clad Paint Co., Cleveland, O.
Jos. Dixon Crucible Co., Jersey City, N. J.
The Ironsides Co., Columbus, O.

PAINT MACHINES—
Cleveland Pneumatic Tool Co., Cleveland, O.
Chicago Pneumatic Tool Co., Chicago, Ill.

PATTERN WORKS—
Gobeille Pattern Co., Cleveland, O.
Forsythe Pattern Works, Youngstown, O.
C. Birnbaum, Cleveland, Ohio.
Balkwill Pattern Works, Cleveland, O.
Mt. Vernon Pattern & Model Works, Mt. Vernon, O.

PERFORATED METALS—
Aitchison Perforated Metal Co., Chicago, Ill.
Fraser & Chalmers, Chicago, Ill.
Hendrick Mfg. Co., Carbondale, Pa.

PIG IRON—
Cabeen Co., Philadelphia, Pa.
Rogers, Brown & Co., Cincinnati, O.
Reed F. Blair & Co., Pittsburg, Pa.
Clinton Iron & Steel Co., Pittsburg.
Bourne-Fuller Co., Cleveland, O.
M. A. Hanna & Co., Cleveland, O.
Pickands, Brown & Co., Chicago, Ill.
F. B. Stevens, Detroit, Mich.
McKeefrey & Co., Leetonia, O.
Superior Charcoal Iron Co., Grand Rapids, Mich.
Spearman Iron Co., Sharpsville, Pa.
Hickman, Williams & Co., Chicago, Ill.
Pickands, Mather & Co., Cleveland, O.
Republic Iron & Steel Co., Chicago, Ill.
American Steel Hoop Co., Pittsburg, Pa.
J. H. Hillman & Son, Pittsburg, Pa.
C. R. Baird & Co., Philadelphia, Pa.
Pilling & Crane, Philadelphia Pa.
Sloss Sheffield Steel & Iron Co., Birmingham, Ala.
Cherry Valley Iron Co., Pittsburg, Pa.
Jerome Keeley & Co., Philadelphia, Pa.
American Steel & Wire Co., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Birmingham, Ala.
Alabama Consolidated Coal & Iron Co., Birmingham, Ala.
A. M. Crane & Co., Chicago, Ill.
Robert Field & Co., Columbus, O.

PIPE (CAST IRON)—
Massillon Iron & Steel Co., Chicago, Ill.
A. M. Crane & Co., Chicago, Ill.

PIPE (RIVETED STEEL)—
Wm. B. Scaife & Sons, Pittsburg, Pa.
Wm. B. Pollock Co., Youngstown, O.
A. M. Crane & Co., Chicago, Ill.
Somers, Fitler & Clarke, Pittsburg, Pa.

PIPE COVERING—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.

PIPE CUTTING AND THREADING MACHINES—
The Armstrong Mfg. Co., Bridgeport, Conn.
Somers, Fitler & Clarke, Pittsburg, Pa.

PIPE FITTERS—
Pittsburg Valve, Fdy. & Construc. Co., Pittsburg, Pa.

PISTON AIR DRILLS—
Cleveland Pneumatic Tool Co., Cleveland, O.
Chicago Pneumatic Tool Co., Chicago, Ill.

PISTON RODS—
Bethlehem Steel Co., South Bethlehem, Pa.

PLANERS—
U. Baird Machinery Co., Pittsburg, Pa.
Bickford Drill & Tool Co., Cincinnati, O.
Danielson Machine & Tool Co., Cleveland, O.
Atlas Machine Co., Pittsburg, Pa.
Springfield Machine Tool Co., Springfield, O.
Somers, Fitler & Clarke, Pittsburg, Pa.

PLANER TOOLS—
Armstrong Bros. Tool Co., Chicago, Ill.

PLANISHED IRON—
American Sheet Steel Co., New York City.

PLATES—
Enterprise Boiler Co., Youngstown, O.
Republic Iron & Steel Co., Chicago, Ill.
Illinois Steel Co., Chicago, Ill.
American Steel & Wire Co., Chicago, Ill.
A. M. Crane & Co., Chicago, Ill.

PLUMBERS' AND GAS FITTERS' SUPPLIES—
C. H. Besly & Co., Chicago, Ill.
The Crane Co., Chicago, Ill.

PNEUMATIC APPLIANCES—
Clayton Air Compressor Works, New York.
W. J. Schaefer Co., New York City.

PNEUMATIC TOOLS—
Chicago Pneumatic Tool Co., Chicago, Ill.
Cleveland Pneumatic Tool Co., Cleveland, O.
American Engineering Works, Chicago, Ill.

PORTABLE FORGE—
C. H. Besly & Co., Chicago, Ill.
Vulcan Mfg. Co., Pittsburg, Pa.
Somers, Fitler & Clarke, Pittsburg, Pa.

POWER PRESSES—
Avery Stamping Co., Cleveland, O.
Bertsch & Co., Cambridge City, Ind.
Cleveland Punch & Shear Wks. Co., Cleveland.
Danielson Machine & Tool Co., Cleveland, O.
Bethlehem F'dry & Mach. Co., S.Bethlehem,Pa.

POWER TRANSMISSION MACHINERY—
Jeffrey Mfg. Co., Columbus, O.
E. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.
I. & E. Greenwald Co., Cincinnati, O.
Link Belt Machinery Co., Chicago, Ill.
A. Leschen & Sons Rope Co., St. Louis, Mo.
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.

PRESSES—
Bertsch & Co., Cambridge City, Ind.
C. H. Besly & Co., Chicago, Ill.
Danielson Machine & Tool Co., Cleveland, O.
Avery Stamping Co., Cleveland, O.
Bethlehem F'dry & Mach. Co., S. Bethlehem, Pa.
Cleveland Punch & Shear Wks. Co., Cleveland.
Atlas Machine Co., Pittsburg, Pa.
Jos. E. Bissell, Agt. Prentiss Tool & Supply Co., Pittsburg, Pa.

PRESSURE GAUGES—
The Bristol Co., Waterbury, Conn.

PULLEYS—
W. A. Jones Foundry Co., Chicago, Ill.
E. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.
Jeffrey Mfg. Co., Columbus, O.
I. & E. Greenwald Co., Cincinnati, O.
Link Belt Machinery Co., Chicago, Ill.
A. Leschen & Sons Rope Co., St. Louis, Mo.
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.
Somers, Fitler & Clarke, Pittsburg, Pa.

PULVERIZING MACHINERY—
Raymond Bros. Impact Pulverizer Co., Chicago.

PUMPS (STEAM)—
The Edward P. Allis Co., Milwaukee, Wis.
Blakeslee Mfg. Co., Du Quoin, Ill.
Fred M. Prescott Steam Pump Co., Milwaukee, Wis.
Southwark Foundry & Machine Co., Philadelphia, Pa.
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.
The Deming Co., Salem, O.
R. D. Wood & Co., Philadelphia, Pa.
Wickes Bros, Pittsburg, Pa.
Torbert & Peckham, Chicago, Ill.

PYROMETERS—
Edward Brown, Philadelphia, Pa.
Vulcan Mfg. Co., Pittsburg, Pa.

RADIAL DRILLS—
Bickford Drill & Tool Co., Cincinnati, O.
Jos. E. Bissell, Agt. Prentiss Tool & Supply Co., Pittsburg, Pa.

RAILS—
Hyde Bros. & Co., Pittsburg, Pa.
American Steel Hoop Co., New York City.
Joseph Schonthal, Pittsburg, Pa.
A. M. Crane & Co., Chicago, Ill.
Somers, Fitler & Clarke, Pittsburg, Pa.

RAILWAY SUPPLIES—
Cleveland City Forge & Iron Co., Cleveland, O.
Garden City Sand Co., Chicago, Ill.
Hyde Bros. & Co., Pittsburg, Pa.
Joseph Schonthal, Pittsburg, Pa.

RECORDING GAUGES—
Somers, Fitler & Clarke, Pittsburg, Pa.

RELAYING RAILS—
Hyde Bros. & Co., Pittsburg, Pa.
A. M. Crane & Co., Chicago, Ill.

RIVETS—
Champion Rivet Co., Cleveland, O.
Vulcanus Forging Co., Cleveland, O.

RIVETED STEEL PIPE—
The Wm. B. Pollock Co., Youngstown, O.

RIVETERS—
R. D. Wood & Co., Philadelphia, Pa.

RIVETING HAMMERS—
Cleveland Pneumatic Tool Co., Cleveland, O.
Chicago Pneumatic Tool Co., Chicago, Ill.

RIVETING MACHINES—
Chicago Pneumatic Tool Co., Chicago, Ill.

ROCK CRUSHERS—
Raymond Bros. Impact Pulverizer Co., Chicago.

ROCK DRILLS—
Rand Drill Co., Chicago, Ill.
The Ingersoll-Sergeant Drill Co., New York.

ROLL FORGINGS—
Samuel Trethewey & Co., Pittsburg, Pa.
Frankford Steel & Forging Co., Philadelphia.

ROLLING MILL MACHINERY—
The United Boiler Co., Girard, O.
Totten & Hogg Iron and Steel Foundry Co., Pittsburg, Pa.
West Penn Foundry & Machine Co., Avonmore, Pa.
Frank-Kneeland Machine Co., Pittsburg, Pa.
A. Garrison Foundry Co., Pittsburg, Pa.
Whiting Foundry Equipment Co., Harvey, Ill.
Canton Roll & Machine Co., Canton, O.
Geo. B. Sennett Co., Youngstown, O.

ROOFS—
Riter-Conley Mfg. Co., Pittsburg, Pa.
Wm. B. Scaife & Sons, Pittsburg, Pa.
McCullough Iron Co., Wilmington, Del.
American Bridge Co., New York City.
Pittsburg Steel Construction Co., Pittsburg, Pa.

ROPE AND CORDAGE—
Waterbury Rope Co., New York City.
Link Belt Machinery Co., Chicago, Ill.
A. Leschen & Sons Rope Co., St. Louis, Mo.
Dodge Mfg. Co., Mishawaka, Ind.
Somers, Fitler & Clarke, Pittsburg, Pa.

ROTARY BREAST DRILLS—
Cleveland Pneumatic Tool Co., Cleveland, O.
Chicago Pneumatic Tool Co., Chicago, Ill.

SAWING AND DRILLING MACHINERY—
J. R. Vandyck, New York City, N. Y.

SAWS—
Peter Gerlach & Co., Cleveland, O.

SCRAP IRON—
Hyde Bros. & Co., Pittsburg, Pa.
Illinois Steel Co., Chicago, Ill.
Joseph Schonthal, Pittsburg, Pa.
F. Greiner, Philadelphia, Pa.
A. M. Crane & Co., Chicago, Ill.

SCREENS FOR COAL, ORE, ETC.
Robt. Aitchison Perforated Metal Co., Chicago.
Hendrick Mfg. Co., Carbondale, Pa.
Jeffrey Mfg. Co., Columbus, O.
The Aultman Co., Canton, O.
Fraser & Chalmers, Chicago, Ill.

SCREWS—
C. H. Besly & Co., Chicago, Ill.
Upson Nutt Co., Cleveland, O.
Chicago Screw Co., Chicago, Ill.

SECOND-HAND MACHINERY—
Hyde Bros. & Co., Pittsburg, Pa.
The Atlas Machine Co., Pittsburg, Pa.
The W. J. Carlin Co., Pittsburg, Pa.
C. C. Wormer Machinery Co., Detroit, Mich.
Carlin Machinery & Supply Co., Allegheny, Pa.
Pelton Engineering Co., Cleveland, O.
Torbert & Peckham, Chicago, Ill.
Jos. E. Bissell, Agt. Prentiss Tool & Supply Co., Pittsburg, Pa.
Joseph Schonthal, Pittsburg, Pa.
Wickes Bros, Pittsburg, Pa.
American Engineering Works, Chicago, Ill.

SEPARATORS—
Harrison Safety Boiler Works, Philadelphia.

SEPARATING MACHINERY—
Raymond Bros. Impact Pulverizer Co., Chicago.

SHAFTING—
E. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
Fitzsimmons & Co., Cleveland, O.
The Aultman Co., Canton, O.
Jeffrey Mfg. Co., Columbus, O.
I. & E. Greenwald Co., Cincinnati, O.
Bethlehem Steel Co., South Bethlehem, Pa.
American Steel & Wire Co., Chicago, Ill.
Link Belt Machinery Co., Chicago, Ill.
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.
Atlas Machine Co., Pittsburg, Pa.
Somers, Fitler & Clarke, Pittsburg, Pa.

SHEARING AND PUNCHING MACHINERY—
Bertsch & Co., Cambridge City, Ind.
Danielson Machine & Tool Co., Cleveland, O.
Cleveland Punch & Shear Wks. Co., Cleveland.
Bethlehem F'dry & Mach. Co., S. Bethlehem, Pa.
Jos. E. Bissell, Agt. Prentiss Tool & Supply Co., Pittsburg, Pa.
R. D. Wood & Co., Philadelphia, Pa.

SHAPERS—
Atlas Machine Co., Pittsburg, Pa.
Springfield Machine Tool Co., Springfield, O.

SHEAR KNIVES—
Samuel Trethewey & Co., Pittsburg, Pa.

SHEET IRON AND STEEL—
Republic Iron & Steel Co., Chicago, Ill.
American Sheet Steel Co., New York City.
American Steel & Wire Co., Chicago, Ill.

SHEET METAL WORK—
The W. J. Clark Co. Salem, O.

SHIP YARDS—
Wm. Cramp & Sons, Philadelphia, Pa.

SOLID STEEL SHEAR KNIVES—
Samuel Trethewey & Co., Pittsburg, Pa.

SPECIAL MACHINERY—
Cleveland Punch & Shear Wks. Co., Cleveland.
Avery Stamping Co., Cleveland, O.
The Aultman Co., Canton, O.
Jeffrey Mfg. Co., Columbus, O.
Wheeling Mold & F'ndry Co., Wheeling, W. Va.
Danielson Machine & Tool Co., Cleveland, O.
Jos. E. Bissell, Agt. Prentiss Tool & Supply Co., Pittsburg, Pa.

STACKS—
Wm. B. Scaife & Sons, Pittsburg, Pa.

STAND PIPES—
The Wm. B. Pollock Co., Youngstown, O.
The United Boiler Co., Girard, O.

STEAM AND GAS FITTERS' TOOLS—
The Crane Co., Chicago, Ill.

STEAM BOILER INSPECTORS—
Hartford Steam Boiler Inspection & Insurance Co., Hartford, Conn.

STEAM HAMMERS—
American Engineering Works, Chicago, Ill.

STEAM PIPE AND BOILER COVERING—
C. H. Besly & Co., Chicago, Ill.

STEAM PACKING—
C. H. Besly & Co., Chicago, Ill.

STEAM PUMPS—
Blakeslee Mfg. Co., Du Quoin, Ill.
Fred. M. Prescott Steam Pump Co., Milwaukee, Wis.
Edw. P. Allis Co., Milwaukee, Wis.
Southwark Foundry and Machine Co., Philadelphia, Pa.
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.
The Deming Co., Salem, O.
R. D. Wood & Co., Philadelphia, Pa.
Wickes Bros, Pittsburg, Pa.
Torbert & Peckham, Chicago, Ill.

STEAM SEPARATORS—
Harrison Safety Boiler Works, Philadelphia.
Wright Manufacturing Co., Cleveland, O.

STEAM SHOVELS AND DREDGES—
Marion Steam Shovel Co., Marion, O.
Torbert & Peckham, Chicago, Ill.
The Bucyrus Co., South Milwaukee, Wis.
The Thew Automatic Shovel Co., Lorain, O.

STEAM SPECIALTIES—
C. H. Besly & Co., Chicago, Ill.
The Crane Co., Chicago, Ill.
The Lunkenheimer Co., Cincinnati, O.

STEEL—
Otis Steel Co., Cleveland, O.
Cabeen Co., Philadelphia, Pa.
Crescent Steel Co., Pittsburg, Pa.
Byron H. White, Chicago, Ill.
Monongahela Iron & Steel Co., Pittsburg, Pa
American Steel Hoop Co., Pittsburg, Pa.
American Steel & Wire Co., Chicago, Ill.
C. R. Baird & Co., Phiadelphia, Pa.
Tennessee Coal, Iron & Railroad Co., Birmingham, Ala.
A. M. Crane & Co., Chicago, Ill.
Champion Iron & Steel Co., Muskegon, Mich.

STEEL BANDS—
American Steel Hoop Co., Pittsburg, Pa.
American Steel & Wire Co., Chicago, Ill.

STEEL BLOOMS AND BILLETS—
American Steel & Wire Co., Chicago, Ill.
Cabeen Co., Philadelphia, Pa.
National Steel Co., Chicago, Ill.
Bethlehem Steel Co., South Bethlehem, Pa.
The Lorain Steel Co., Lorain, O.
American Steel Hoop Co., Pittsburg, Pa.
C. R. Baird & Co., Philadelphia, Pa.
Jerome Keeley & Co., Philadelphia, Pa.
Tennessee Coal, Iron & Railroad Co., Birmingham, Ala.
Champion Iron & Steel Co., Muskegon, Mich.
A. M. Crane & Co., Chicago, Ill.

STEEL CARS—
The Pressed Steel Car Co., Pittsburg, Pa.

STEEL CASTINGS—
Otis Steel Co., Cleveland, O.
Bethlehem Steel Co., South Bethlehem, Pa.
Acme Steel & Malleable Iron Works, Buffalo, N. Y.
The Sargent Co., Chicago, Ill.

STEEL CEILINGS—
Berger Manufacturing Co., Canton, O.

STEEL FRAME MILL BUILDINGS—
Wm. B. Scaife & Sons, Pittsburg, Pa.
American Bridge Co., New York City.
Pittsburg Steel Construction Co., Pittsburg, Pa

STEEL HOOPS—
American Steel Hoop Co., Pittsburg, Pa.

STEEL PLANTS—
The Wm. B. Pollock Co., Youngstown, O.
The Riter-Conley Co., Pittsburg, Pa.

STEEL SHEETS—
Republic Iron & Steel Co., Chicago, Ill.
American Sheet Steel Co., New York City.
American Steel & Wire Co., Chicago, Ill.

STEEL STAMPS—
F. A. Stackmann, Cleveland, O.

STENCILS—
F. A. Stackmann, Cleveland, O.

STOCKS AND DIES—
The Crane Co., Chicago, Ill.
Somers, Fitler & Clarke, Pittsburg, Pa.

TANKS—
Enterprise Boiler Co., Youngstown, O.
Meehan Boiler & Construction Co., Lowellville, O.
Wm. B. Scaife & Sons, Pittsburg, Pa.
The Wm. B. Pollock Co., Youngstown, O.
Riter-Conley Mfg. Co., Pittsburg, Pa.
The Aultman Co., Canton, O.
The United Boiler Co., Girard, O.

TANK CARS—
Wm. B. Pollock Co., Youngstown, O.

TESTING MACHINERY—
Keystone Driller Co., Beaver Falls, Pa

TIN AND TERNE PLATES—
American Tin Plate Company, New York City.
Champion Iron & Steel Co., Muskegon, Mich.

TIN PLATE MACHINERY—
Totten & Hogg Iron and Steel Foundry Co., Pittsburg, Pa.
West Penn Foundry & Machine Co., Avonmore, Pa.
Canton Roll & Machine Co., Canton, O.

TOOL HOLDERS—
Armstrong Bros. Tool Co., Chicago, Ill.

TOOL STEEL—
C. H. Besly & Co., Chicago, Ill.
Crescent Steel Co., Pittsburg, Pa.
Monongahela Iron & Steel Co., Pittsburg, Pa.
American Steel & Wire Co., Chicago, Ill.
Somers, Fitler & Clarke, Pittsburg, Pa.

TRAMWAYS—
A. Leschen & Sons Rope Co., St. Louis, Mo.

TRANSMISSION MACHINERY—
Link Belt Machinery Co., Chicago, Ill.
W. A. Jones Foundry & Machine Co., Chicago.
Jeffrey Mfg. Co., Columbus, O.
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.
The Brown Hoisting Machinery Co., Cleveland, O.

TRANSMISSION ROPE (WIRE)—
American Steel & Wire Co., Chicago, Ill.

TROLLEY TRACKS—
Northern Engineering Works, Detroit, Mich.
Whiting Foundry Equipment Co., Harvey, Ill.

TROLLEY WIRES—
American Steel & Wire Co., Chicago, Ill.

TRUCKS—
Northern Engineering Works, Detroit, Mich.

TUBES—
National Tube Co., Pittsburg, Pa.
S. Fix' Sons, Cleveland, O.

TUBE WELDING—
S. Fix' Sons, Cleveland, O.

TUMBLERS—
Northern Engineering Works, Detroit, Mich.
Whiting Foundry Equipment Co., Harvey, Ill.

TURBINE WATER WHEELS—
Stilwell-Bierce & Smith Vaile Co., Dayton, O.

TURNBUCKLES—
Republic Iron & Steel Co., Chicago, Ill.
Ceveland City Forge & Iron Co., Cleveland, O.
Somers, Fitler & Clarke, Pittsburg, Pa.

TWIST DRILLS—
C. H. Besly & Co., Chicago, Ill.

TWIST DRILL CASES—
Vulcan Mfg. Co., Pittsburg, Pa.
Somers, Fitler & Clarke, Pittsburg, Pa.

VALVES—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.
Pittsburg Valve Foundry & Construction Co., Pittsburg, Pa.
The Crane Co., Chicago, Ill.
The Lunkenheimer Co., Cincinnati, O.
Somers, Fitler & Clarke, Pittsburg, Pa.

WASHERS—
Avery Stamping Co., Cleveland, O.
Milton Manufacturing Co., Milton, Pa.
Somers, Fitler & Clarke, Pittsburg, Pa.

WATER COLUMNS—
Somers, Fitler & Clarke, Pittsburg, Pa.

WATER PIPE—
Massillon Iron & Steel Co., Chicago, Ill.

WATER SOFTENING PLANTS—
We Fu Go Co., Cincinnati, O.
Pittsburg Filter Mfg. Co., Pittsburg, Pa.

WIRE—
American Steel & Wire Co., Chicago, Ill.
Summit Wire Co., Cuyahoga Falls, O.

WIRE COATING—
The Ironsides Company, Columbus, O.

WIRE FENCING—
American Steel & Wire Co., Chicago, Ill.

WIRE FILLER—
The Ironsides Co., Columbus, O.

WIRE MACHINERY—
S. W Goodyear, Waterbury, Conn.
F. B. Shuster Co., New Haven, Conn.

WIRE NAILS—
American Steel & Wire Co., Chicago, Ill.

WIRE ROPE—
Waterbury Rope Co., New York City.
A. Leschen & Sons Rope Co., St. Louis, Mo.
American Steel & Wire Co., Chicago, Ill.

WIRE ROPE COATING—
The Ironsides Company, Columbus, O.
Somers, Fitler & Clarke, Pittsburg, Pa.

WIRE ROAP FILLING—
The Ironsides Co., Columbus, O.

WOOD PULLEYS—
Dodge Mfg. Co., Mishawaka, Ind.
Somers, Fitler & Clarke, Pittsburg, Pa.

WROUGHT PIPE—
National Tube Co., Pittsburg, Pa.
Pittsburg Valve Foundry & Construction Co., Pittsburg, Pa.
The Crane Co., Chicago, Ill.
Somers, Fitler & Clarke, Pittsburg, Pa.

# Alphabetical List of Advertisers.

The star (*) indicates that the adv. appears alternate weeks; the dagger (†) once a month; the double dagger (‡) once in three weeks; the parallel (‖) three times out of four.


| | PAGE |
|---|---|
| Acme Steel & Malleable Iron Works | 3 |
| Aitchison Rob't, Perforated Metal Co. | 41 |
| Alabama Consolidated Coal & Iron Co | 45 |
| Allen, E. R | 27 |
| Allis & Co., Edward P | 31 |
| American Bridge Co | 48 |
| American Engineering Works | 32 |
| American Sheet Steel Co | 48 |
| American Steel Hoop Co | 52 |
| American Steel and Wire Co | 51 |
| American Tin Plate Company | 53 |
| Armstrong Bros Tool Co | 1 |
| Armstrong Mfg. Co | 39 |
| Atlas Machine Co., The | 54 |
| Aultman Co | 2 |
| Avery Stamping Co | 62 |
| Baird & Co, C. R | 45 |
| Baird Machinery Co., U | 32 |
| Baker Mfg. Co., James H | 35 |
| Balkwill Pattern Works | 44 |
| *Berger Mfg. Co | 37 |
| *Bertsch & Co | — |
| Besly & Co., Chas. H | 62 |
| Bessemer Coke Co | 2 |
| Best Mfg. Co | 38 |
| Bethlehem Foundry & Machine Co | 39 |
| Bethlehem Steel Co | 61 |
| *Bickford Drill & Tool Co | — |
| Bickford, H | 62 |
| Birnbaum C | 62 |
| Bissell, Jos. E | 1 |
| Blair & Co., Reed F | 2 |
| Blakeslee Mfg. Co | 1 |
| Bourne-Fuller Co | 1 |
| Brass Founders' Supply Co | 47 |
| Bristol Co, The | 1 |
| *Brown, Edward | 1-40 |
| Brown Hoisting Machinery Co | 40 |
| Bucyrus Co | 35 |
| Bultman & Co., F. H | 35 |
| Cabeen & Co | 45 |
| Cahall Sales Department | 1 |
| Canton Roll & Machine Co | 43 |
| Carborundum Co., The | 33 |
| Carlin Machinery & Supply Co | 54 |
| Carlin Co., The W. J | — |
| Champion Iron & Steel Co | 52 |
| Champion Rivet Co | 27 |
| Cherry Valley Iron Co | 62 |
| Chicago Drop Forge & Foundry Co | 1 |
| Chicago Fire Brick Co | 47 |
| Chicago Pneumatic Tool Co | 28 |
| Chicago Press Clipping Bureau | 61 |
| *Chicago Rawhide Mfg. Co | — |
| Chicago Screw Co | 1 |
| Church, Seymour R | 28 |
| †Clapp Mfg. Co., R. D | 37 |
| Clark Co., The W. J | 33 |
| Clarkeson & Co., John L | 2 |
| Clayton Air Compressor Works | 2 |
| Clearfield Fire Brick Co | 46 |
| Cleveland City Forge & Iron Co | 1 |
| Cleveland Crane & Car Co | 40 |
| †Cleveland Facing Mill Co | 37 |
| Cleveland Pneumatic Tool Co | 28 |
| Cleveland Punch & Shear Works | 43 |
| Clinton Iron & Steel Co | 45 |
| Cole, J. Wendell | 62 |
| Columbus Machine Co | 39 |
| Covert Mfg Co | 39 |
| Cramp & Sons, Wm | 34 |
| Crane Co., The | 33 |
| Crane & Co., A M | 55 |
| Crescent Steel Co | 28 |
| Crown Fire Clay Co | 47 |
| Danielson Machine & Tool Co | 62 |
| Davis, George C | 62 |
| Delano, E. A | 61 |
| Deming Co., The | 28 |
| Dixon Jos., Crucible Co | 61 |
| Dodge Mfg. Co | 44 |
| Dover Fire Brick Co | 47 |
| Drake Acetylene Apparatus Co | 38 |
| Drake, Bartow & Co | 45 |
| Ehlen, John H | 46 |
| Emmerton, F. A | 2 |
| Enterprise Boiler Co | 1 |
| Erickson, Edward E | 27 |
| Exeter Machine Works | 40 |
| Field & Co., Robert | 24 |
| *Fix Sons | — |
| Forsythe Pattern Works | 44 |
| Frankford Steel & Forging Co | 44 |
| Frank-Kneeland Machine Co | 43 |
| Fraser & Chalmers | 41 |
| Frick Coke Co., H. C | 1 |
| Gandy Belting Co | 62 |
| Garden City Sand Co | 47 |
| Garrison Foundry Co | 42 |
| Gerlach, Peter & Co | 28 |
| Gobeille Pattern Co | 44 |
| Goodyear, S. W | 39 |
| Grasselli Chemical Co | 26 |
| Greenwald Co., I & E | 31 |
| Greiner, F | 54 |
| Haines Gauge Co | 2 |
| Hall, R. C | 26 |
| Hanna & Co., M. A | 45 |
| Harrisburg Foundry & Machine Works | 54 |
| Harrison Safety Boiler Works | 24 |
| Hartford Steam Boiler Insp. & Ins. Co | 34 |
| Haws Fire Brick Co., W. H | 47 |
| Haws & Sons, A. J | 47 |
| Hendrick Mfg. Co, The | 41 |
| Hickman, Williams & Co | 45 |
| Hiertz & Son, Theo | 2 |
| Hillman & Son, J H | 1 |
| Holmes & Co., F B | 46 |
| Hooven, Owens & Rentschler Co | 35 |
| Hunt & Co., Robt. W | 2 |
| Hyde Bros. & Co | 54 |
| Illinois Steel Co | 54 |
| Ingersoll-Sergeant Drill Co | 2 |
| International Correspondence Schools | 46 |
| Iron Clad Paint Co | 43 |
| Ironsides Co | 26 |
| Jeffrey Mfg. Co | 46 |
| Jenkins Bros | 33 |
| Jones Foundry & Machine Co., W. A | 1 |
| Keeley & Co., Jerome | 26 |
| Kennedy, Julian | 41 |
| Kennedy, Walter | 41 |
| Kentucky Fire Brick Works | 27 |
| Keystone Driller Co | 39 |
| Keystone Fire Clay Co., The | 46 |
| Lake Superior Consolidated Iron Mines | 45 |
| Lamond David | 41 |
| Laughlin & Co., Alex | 41 |
| Leschen & Sons Rope Co., A | 39 |
| Lidgerwood Mfg. Co | 40 |
| Link-Belt Machinery Co | 40 |
| Lorain Foundry Co | 41 |
| Lorain Steel Co | 53 |
| Lunkenheimer Co., The | 33 |
| Marion Steam Shovel Co | 62 |
| Massillon Iron & Steel Co | 28 |
| McKeefrey & Co | 45 |
| Meadville Malleable Iron Co | 2 |
| Meehan Boiler & Construction Co | 62 |
| Millet Core Oven Co | 38 |
| Milton Manufacturing Co | 50 |
| Monongahela Iron & Steel Co | 28 |
| Mt. Vernon Pattern & Model Works | 44 |
| National Elastic Nut Co | 39 |
| National Steel Co | 50 |
| National Tube Co | 50 |
| †Newport Sand Bank Co | 36 |
| Northampton Emery Wheel Co | 34 |
| Northern Engineering Co | 40 |
| Nuttall Co., The R. D | 35 |
| Oak Hill Fire Brick & Coal Co | 27 |
| Obermaver Co, S | 30 |
| O'Gara, King & Co | 44 |
| Oglebay, Norton & Co | 45 |
| †Ohio Sand Co | 37 |
| Otis Steel Co | 26 |
| Pelton Engineering Co | 54 |
| Perfect Lubricating Metal Co | 62 |
| Phœnix Horse Shoe Co | 27 |
| Pickands, Brown & Co | 45 |
| Pickands, Mather & Co | 45 |
| Pilling & Crane | 1 |
| Pittsburg Filter Mfg. Co | 55 |
| Pittsburg Steel Construction Co | 2 |
| Pittsburg Valve, Foundry & Construction Co | 38 |
| Pollock Co., The Wm. B | 2 |
| Pratt Chuck Co | 39 |
| Prescott Steam Pump Co | 34 |
| Pressed Steel Car Co., The | 49 |
| *Pullman, J. Wesley | 45 |
| Rand Drill Co | 3 |
| Raymond Bros. Impact Pulverizer Co | 2 |
| Reese-Hammond Fire Brick Co | 46 |
| Republic Iron & Steel Co | 1-53 |
| Riter-Conley Mfg. Co | 41 |
| Rogers, Brown & Co | 1-25 |
| *Rockwell Engineering Co | 1-29 |
| Rosenow & Co | 37 |
| Ryan, J. J. & Co | 62 |
| Sackmann, F. A | 55 |
| Sargent Co., The | 52 |
| Scaife & Sons, Wm. B | 61 |
| Schonthal, Joseph | 54 |
| Schuylkill Iron & Steel Co | 61 |
| Scientific Manufacturing Co | 42 |
| Scioto Fire Brick Co | 47 |
| Scioto Star Fire Brick Works | 47 |
| Seaman, Sleeth Co | 42 |
| Sennett Co, Geo, B | 31 |
| ‖Sharon Fire Brick Works | — |
| Shuster Co., F. B | 55 |
| Sloss Iron & Steel Co | 49 |
| Sloss Sheffield Steel & Iron Co | 49 |
| Smith & Co., A. F | 47 |
| Somers, Fitler & Clarke | 1 |
| Southwark Foundry & Machine Co | 31 |
| Spearman Iron Co | 62 |
| Springfield Machine Tool Co | 1 |
| Standard Chain Co | 46 |
| Stevens, F. B | 37-62 |
| Stilwell-Bierce & Smith-Vaile Co | 1-25 |
| Summit Wire Co | 52 |
| *Superior Charcoal Iron Co | — |
| *Tabor Mfg. Co | 46 |
| Tennessee Coal, Iron & Railroad Co | 49 |
| Textor, O | 2 |
| Thew Automatic Shovel Co., The | 2 |
| Tod, Stambaugh & Co | 45 |
| Tod, Wm. & Co | 31 |
| Torbert & Peckham | 54-55 |
| Totten & Hogg Iron & Steel Foundry Co | 42 |
| Trethewey & Co., Ltd., Samuel | 28 |
| Union Mining Co | 26 |
| United Boiler Co | 41 |
| United States Telephone Co | 2 |
| Upson Nut Co | 1 |
| Van Dorn & Dutton Co | 35 |
| Vandyck, J R | 30 |
| *Vulcan Iron Works | — |
| Vulcan Mfg. Co | 28 |
| *Vulcanus Forging Co | — |
| Waterbury Rope Co | 39 |
| Webster, Camp & Lane Machine Co | 27 |
| Webster Fire Brick Co | 1 |
| Webster Foundry Sand Co | 47 |
| Wellman-Seaver Engineering Co | 41 |
| †Wefugo Co | 37 |
| West Penn Foundry & Machine Co | 43 |
| Wheeling Mold & Foundry Co | 62 |
| White, By on H | 28 |
| Whiting Foundry Equipment Co | 40 |
| Wickes Bros | 54 |
| Wood & Co. R. D | 30 |
| Wormer Machinery Co., C. C | 54 |
| Wright Manufacturing Co | 27 |
| Wyman & Gordon | 61 |